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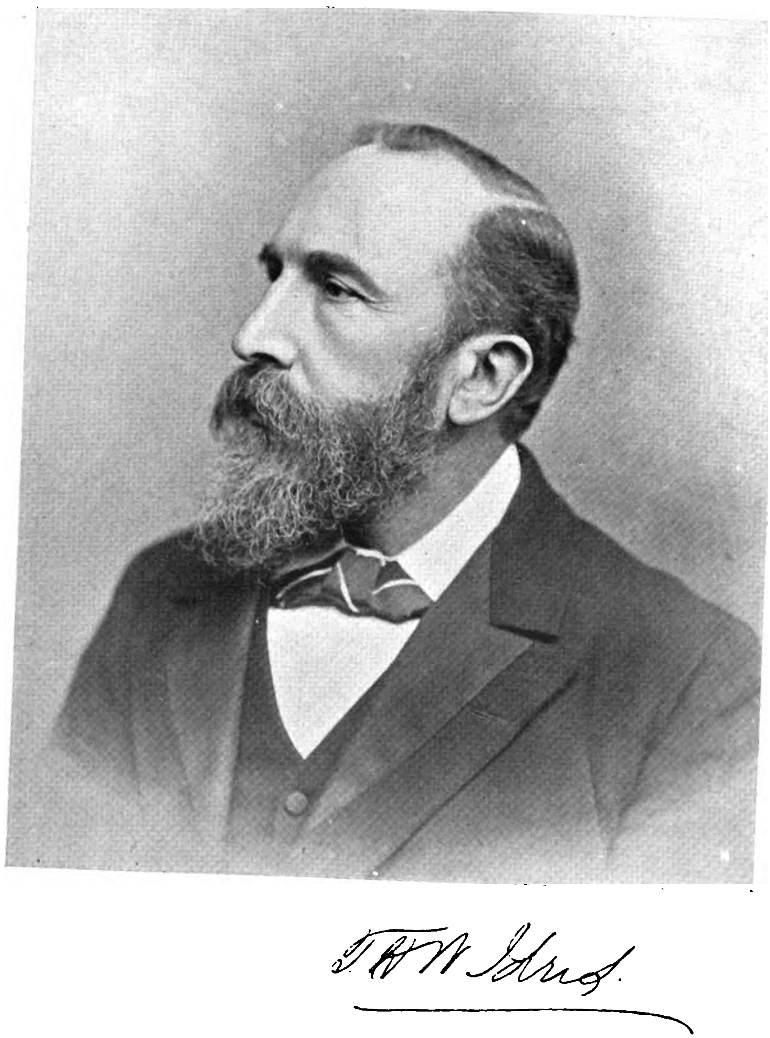

YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS

FROM JULY 1, 1902, TO JUNE 30, 1903,

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

FORTIETH ANNUAL MEETING

HELD IN

BRISTOL

JULY, 1903

EDITOR OF THE YEAR-BOOK,

J. O. BRAITHWAITE.

EDITORS OF THE TRANSACTIONS,

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The duties the Local Corresponding Secretaries have undertaken to discharge are briefly as follows:—

(*a*) To bring under the notice of pharmacists, principals, and their assistants, in their districts, who are unassociated with the Conference, the advantage of membership with it, and by personal effort to try and induce them to join.

(*b*) To assist in stimulating research by asking pharmacists, who have the time, ability, and disposition, to contribute from time to time a paper or useful note to the annual meetings.

(*c*) To endeavour to induce defaulters to continue their membership

(*d*) To take generally a watchful and sympathetic interest in the affairs of the Conference.

To render those services voluntarily at times convenient to themselves and as opportunity offers.

THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is published early in the year (see page 349). Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meeting for 1904 will be held at Sheffield.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretaries, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7*s*. 6*d*. for members residing within the Postal Union. Further information may be obtained from

THE ASST. SECRETARY, BRIT. PHARM. CONF.,
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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 355.

LIST OF CONTENTS.

INTRODUCTION.

AGAIN the manipulative skill and philosophical reasoning of the chemists of the eminent French school have attracted the attention and evoked the admiration of the scientific world, as well as the appreciation of technical experts, by the brilliant results achieved during the past twelve months. The remarkable properties of *radium* as demonstrated by the *Curies* recently in this country, have elicited much discussion among chemists and physicists, the results of which may not yet be evident; but which seem destined so far to affect some of the fundamental theories of chemical philosophy, that these may have to be modified, if not abandoned. Although the subject is one which is, strictly speaking, without the range of pharmaceutical chemistry, the results obtained, and those yet to be investigated, have such important bearings that we have included a notice of them in the *Year-Book*, together with a concise history of *radium* as summarized by *C. W. Ranolt.*

Another distinguished French chemist, *H. Moissan*, has, with collaborators, continued his investigations of the elements and certain of their simple compounds. Some of these experiments have been conducted at infinitely low temperatures, others at the highest degrees of heat. These facts alone indicate the constructive and manipulative skill required to instal the apparatus even before the experiment can be performed. His work on the behaviour of the *allotropic forms of carbon towards heat* are of great interest; the influence of extremely low temperature on the properties of *fluorine*, a research conducted with the assistance of *J. Dewar*, indicate that the prediction of theorists, that at very low temperatures, chemical affinity would be extinguished, is not borne out by fact. Even at 20·5° absolute, or −252°C., it maintains its energetic affinity for hydrogen. The same investigator has succeeded in *solidifying fluorine* at extremely low temperatures, finding its melting point to be about 40° absolute or −233°C. He has also prepared *iodine pentafluoride* and studied its properties; also the *compounds of ammonium with rubidium and cæsium*, as well

as the *silicides of vanadium* and the *hydrides of cæsium and of rubidium*. *P. Barbier* has prepared a new *ammonio-manganic pyrophosphate*. *A. Gautier* shows that *arsenium*, in minute quantity, is universally distributed in animals and minerals; but that its occurrence in the former is limited to certain organs. *G. Bertrand* demonstrates the presence of that element in *eggs*, and considers, in opposition to *Gautier*, that its distribution is universal in the animal organism, and not localized. *A. Granger* treats of the compound formed by *arsenium* with copper, to which he attributes the formula Cu_5As_2. *Mentrel* has investigated the compounds of *barium* with *ammonium*. *P. Thibault* shows that the so-called *bismuth iodogallate* is not a definite salt. *L. Barthe* gives a method for preparing *bismuth glycerophosphate*. *Sterba* has prepared *cerium silicide*, $CeSi_2$. *P. Lebeau* and *J. Figueras* a series of compounds of *silicon* with *chromium*, $SiCr_3$, $SiCr_2$, Si_2Cr_3 and Si_2Cr. *P. Lebeau* has isolated two *manganese silicides*, Mn_2Si, and $MnSi_2$, also *aluminate of manganese*, $MnAl_2O_4$. *Colson* has studied the action of acetic acid on lead oxide, which leads to the formation of *lead tetracetate*, and *M. Guerbet* discusses the two *mercury lactates*.

Hydrogen peroxide, having been gradually increased in strength, has at last been isolated in a pure crystallizable condition by *W. Stoedel*. *A. Bach* has shown that the ozonic acid of *Baeyer* and *Villiger* is *hydrogen tetroxide*. *T. J. Metzger* records the curious fact that fumaric acid is an excellent precipitant for *thorium*, separating it from accompanying and closely-related metals. *C. Baskerville* and *H. H. Bennett* have obtained *arsenic pentachloride*, $AsCl_5$, in a crystalline condition. *W. O. Rabe* and *A. Steinmetz* have thoroughly investigated the *oxalates of thallium*. *R. A. Robinson, Junr.*, points out that official sulphurous acid may be conveniently prepared from the commercial compressed gas.

But few new alkaloids have been put on record. *W. G. Boorsma* has found and described a new base, *strychnicine*, from the leaves of *Strychnos nux vomica*. *Frankel and Wogrinz* state that the aroma of tobacco is due to a *volatile base*, probably *nicotiamine*, but *Gawalowski* considers this to be merely a mixture of volatile salts of nicotine. *P. Siedler* has succeeded in separating *yohimbine* into two bases, and claims to have isolated four distinct alkaloids from yohimbi bark.

The *Proceedings of the American Pharmaceutical Association* were productive in good work in alkaloidal investigation.

J. O. Schlotterbeck showed the so-called "chelidoxanthin" of *Stylophorum diphyllum* and *Chelidonium majus* to be identical with *berberine*. *Isopyroine*, a new base, was isolated from *Isopyrum biternatum* by *G. B. Frankforter; two new bases*, not yet named, were announced as occurring in *Eschscholtzia californica* by *R. Fischer*, who also detected the presence of two other new bases, besides protopine, in *Dicentra cucullaria*. *J. O. Schlotterbeck* and *H. C. Watkins* continued their work on *Adlumia cirrhosa*, and have separated five bases therefrom, and *H. M. Gordin* described a practical method for the separation of strychnine from brucine.

The ipecacuanha alkaloids have received much attention at the hands of Continental chemists and therapeutists, without, however, in any material manner modifying the chemical results arrived at long ago in this country. *B. H. Paul* and *A. J. Cownley* report on the alkaloidal value of the Indian variety of the root. *G. Ferrichs* and *N. de Fuentes-Tapis* deal at considerable length with the analysis of ipecacuanha and the determination of its alkaloids; a note of criticism of which treatise is raised, with authority, by *Paul and Cownley*. *A. H. Allen* and *G. E. Scott-Smith* direct attention to the similarity between certain colour reactions of the *ipecacuanha alkaloids* and those of *morphine*. *J. Gadamer* foreshadows the isolation of at least two bases from *calumba root* which differ from berberine. *A. E. Tanner* has obtained a new morphine salt, the *acid tartrate*, $C_{17}H_{19}NO_3.C_4H_6O_6$. *W. Karsten* indicates the presence of *choline* and *trigonelline* in the root of *Strophanthus hispidus*. *J. Dekker* reports on the relative proportion of *caffeine* and *theobromine* in fresh *kola* and *cacao leaves*. *E. Schmidt* discusses the constitution of the *scopoline* molecule. *E. Dowzard* publishes a method for the separation of *brucine* and *strychnine*, which, in the main principle, closely resembles the method of *Gordin*. *A. B. Lyons* communicates a note on the same subject, the process being based on the different solubilities of the sulphates of those alkaloids. *F. H. Alcock* obviates the difficulty due to the formation of an inseparable emulsion in the official process for the assay of extract of *nux vomica* by a simple modification of the method. *A. H. Allen* and *G. E. Scott-Smith* give a method for the detection of *opium*, and, by inference, of *paregoric* in such preparations as cough mixtures. *Helch* publishes a reaction for the detection of *apomorphine*, which is commented on by *A. Wangerin*. *R. Pschorr*, *B. Joeckel* and *H. Fecht* have succeeded in obtaining *apomorphine* in a crystalline condition. *G. Fromme* brings forward

a process for the determination of *hydrastine; J. Dekker* for *caffeine* and *theobromine*. *Wangerin* gives a distinctive reaction for *narceine*. *P. van der Wielen* shows how *narcotine* and *codeine* may be determined in opium. *J. Toth* modifies the method of *Keller* for the determination of *nicotine* in tobacco products. *H. Helch* also gives a new reaction for *pilocarpine*. *A. Jorissen* for *hydrastinine*, and *E. Hirschsohn* for *quinine* and *quinidine*. *G. Denigès* makes use of the fluorescent properties of *quinine* solutions to detect that alkaloid in extremely minute quantities. *W. Mueller* publishes a suggestive paper on the *solubilities of alkaloids*, which will probably have useful application in directing the employment of the most suitable solvents for isolating these bases in the course of analysis.

Essential oils continue to attract much attention. As the knowledge of the chemistry of these products advances, so, it would appear, does the misapplied ingenuity of sophistication increase, with the result that analysts have constantly to guard against insidious and skilful adulteration. *E. Tardy* notes the admixture of *fennel oil stearoptene* with *anise oil*. *E. J. Parry* comments on the increasing use of *light camphor oil* as an adulterant. *E. Kremers* has found *cedar oil* to be largely used to cheapen *cassia oil*, and notes that mere determination of aldehydic content is not sufficient to establish the purity of the oil. *J. E. Weber* has encountered *lavender oil* adulterated with *salicylic acid*. *Triacetin* has been detected in *peppermint oil* by *C. T. Bennett;* this is a particularly ingenious fraud, since not only is its detection difficult, but, from the nature of the adulterant, only a small amount is requisite to materially increase the apparent "ester value" of the oil. *E. J. Parry* has found a foreign *sequiterpene*, probably that of *African copaiba oil*, to be employed to adulterate *peppermint oil*. The same chemist has detected the admixture of *acetone* with *lemongrass oil*.

Decyl aldehyde and *cumic aldehyde* have been found as normal constituents of the oil of *Acacia farnesiana*. *Schimmels* find that pure *empyreumatic oil of amber* does not possess the characters usually met with in that commercial product which usage has rendered acceptable in England. *E. Miller* has examined the oil of *Asarum arifolium* and isolated its chief constituents. A new *ketone* has been isolated from *Atlas cedar oil* by *B. Grimal*. *Bystropogon origanifolius* yields an oil in which *Schimmels* have found *pulegone* and *menthone*. *P. Kauffeisen* gives a useful and practical note on *cade oil* and its substitutes. *P. Genvresse* and

E. Chablay show that the so-called "*marjoram*" *oil* of Southern France is derived from *Calamintha nepeta;* it contains a new ketone, *calaminthone. R. Beckstroem* reverts to the composition of *calamus oil*, the constituents of which are now pretty fully worked out. An interesting communication on *camphor* and *camphor oil* production appears from the pen of *N. Sugiyama. E. Dowzard* shows that *commercial camphor oil*, as met with at present, contains but little safrol. *Schimmels* announce that *carvol*, as well as another phenol, is present in this oil; *caprylic acid* and an unidentified fatty acid are also among its constituents. A controversy as to the characters of true *citron oil* has occurred between the *London Essence Company, Gulli* and *Schimmels. E. Kremers* notes that iodol affords a distinctive reagent for the detection of *cineol. Safrol* and *linalol* are found by *Schimmels* to occur in *cinnamon leaf oil.* The characters of unadulterated *citronella oil* are given by *E. J. Parry* and *C. T. Bennett. Schimmels* and also *E. C. Spurge* agree as to unreliability of *Thom's* method for the determination of *eugenol* in *clove oil*; both, independently, arrive at the conclusion that the modified process of *Umney* gives good results, sufficiently accurate for practical purposes. *Spurge* has worked out the various methods in detail, and shows where each fail to give accurate results. *Schimmels* find that *methyl-heptyl-ketone* occurs in *clove oil* as well as in oil of rue. *Sugiol* is the name given to a new neutral body isolated by *C. Kimoto* from the oil of *Cryptomeria japonica.* The presence of *phellandrene* in *dill oil* is considered by *Schimmels* to indicate that the herb, as well as the fruits, has been employed for distillation. *E. Dowzard* points out that *commercial eucalyptus oil* is now generally met with rich in *cineol. E. Tardy* has compared *Algerian* and *Galician bitter fennel oil* and finds them to present marked differences. *E. Parone* finds *gardenia oil* to contain benzyl acetate, styrolyl acetate, linalol, linalyl acetate, terpineol and methyl anthranilate. *A. C. Chapman* records the constituents of *hop oil* as being humulene, myrcene, linalol, linalyl iso-nonoate, with a di-terpene and a geraniol ester. *E. Tardy* indicates the difference between the oils of *Illicium religiosum* and *I. anisatum. Schimmels* add methyl-heptenone and terpineol to the hitherto recorded constituents of *lemon oil. E. Charabot* finds that the *essential oil of mandarin orange leaves* is extremely rich in methyl methylanthranilate. *H. von Soden* and *W. Rojahn* record the occurrence of *naphthalin* in the essential oil of storax bark. *Schimmels* give a very complete

analysis of the constituents of *neroli oil.* *A. Hesse* and *O. Zeitschel* announce the occurrence of the alcohol "*nerol*" and its esters in this oil; it is very closely related to geraniol. They also find *nerol* to occur in *petit-grain oil.* The same authors deal with the distinctive characters of *concrete orange oil* and the *oil of orange flower water*. *E. Dowzard* states that the official physical constants for *rosemary oil* are too low. *F. B. Power* has reported on the constituents of a *rue oil*, supplied as English, which proved to be of Algerian origin. *A. Hesse* treats of the differences of *tuberose oil* obtained by *enfleurage* and by extraction with petroleum ether. *Schimmels* are unable to confirm the statement of *Verley* as to the existence of the ketone *tuberone* in this oil. *P. Genvresse* and *G. Langlois* have investigated *oil of vetiver*, the chief constituents of which they find to be vetivene and vetivenol. *Schimmels* give a very complete list of the constituents of *French lavender oil.* Ethyl cinnamate and a new hydrocarbon, $C_{15}H_{32}$, have been isolated by *P. van Romburgh* from *Kampferia galanga oil.*

Civet has attracted much attention from analysts, *A. Hébert*, *E. J. Parry*, and *H. E. Burgess* having reported on it. All agree that the commercial article is much adulterated. The first-named has indicated skatol as a normal constituent, which *Burgess* is unable to confirm. All find that the genuine article is soluble in chloroform and other organic solvents. *A. L. Winton* and *M. Silverman* publish a useful scheme for the analysis of *vanilla essences*, and *A. Moulin* gives a colorimetric method for the determination of *vanillin.*

T. Fawsett indicates the method to be followed for the isolation of salicin, and *O. Brown* shows in what part of willow bark the glucoside occurs. In view of the reputed value of whortle-berries in the treatment of enteric fever, the examination of the *constituents* of the closely-allied *Vaccinium vitis-idæa* by *M. Karger* is of interest. *A. Tschirch* and *F. Koritschoner* have isolated the constituents of *Russian white pitch;* the first-named author, with *O. Saal*, has investigated the *elemi* from *Protium carana*, and with *J. Kremer*, that derived *Almessega branca*, thus continuing his researches on the constituents of various kinds of elemi.

E. White confirms the statement of *Kremel* and others as to the non-existence of *Kinoin* in official kino. *T. H. Easterfield* and *B. C. Aston* have extracted two glucosides, *karakin* and *corynocarpin* from the fruits of *Corynocarpus lævigata*. *Cetraric acid* has been re-established as a constituent of Iceland moss by

O. Simon after its existence had been doubted by *O. Hesse*. *M. Bamberger* has obtained a crystalline bitter acid from hops, to which the formula $C_{20}H_{30}O_5$ or $C_{20}H_{28}O_5$ is given. *F. Retzlaff* has carried further the knowledge of the glucoside *grateolin*. The leaves of *Eupatorium rebaudianum* are stated to possess remarkable sweetening properties, the cause of which would repay investigation. A new glucoside from the seeds of *Drega rubicunda* is shown by *W. Karsten* to somewhat resemble strophanthin, but not to be so toxic. *F. B. Power* has found no alkaloid present in the fish poison *Derris uliginosa*, but has isolated two resins, one of which appears to contain the toxic principle, which is not a glucoside. *O. Hesse* has isolated four new bodies from *coca* leaves, the glucosides *cocacitrin* and *coca-flavin*; the sugar *cocaose*, and *cocacetin*, which is the decomposition product of cocacitrin. *R. Clauser* has further investigated *catechin*. A new vegetable cholesterol, *anthesterin*, has been found by *T. Klobb* in the capitula of *Anthemis nobilis*. *E. Léger* has made notable advances in his researches on the *aloins*, which enable him to show the probable structure of the aloin molecule.

In the course of an interesting communication on curious animal and vegetable oils inquired for in American pharmacy, *L. F. Kebler* and *G. R. Pancoast* give the characters of *bear's fat*, *rattlesnake oil*, and *skunk oil*, and *F. Jaeckle* has examined the constituents of *human* fat. The so-called cholesterol of maize oil is shown by *A. H. Gill* and *C. G. Tufts* to be identical with *sitosterol* from wheat and rye. *D. Holde* has thoroughly examined the *fixed oil* of *Datura stramonium*. *Cohune nuts* and *mafoureira nuts* have been examined at the Imperial Institute and found to yield useful oils, the characters of which are given. *D. Holde* and *M. Stange* show that *glycerides* of fats are often of a complex nature.

Maisin, $C_{184}H_{300}N_{46}O_{51}S$, is the name given by *E. Donald* and *H. Labbé* to a new albuminoid obtained from maize flour. *C. Delezenne* and *H. Mouton* have found two organic *ferments* in *fungi*, one a kinase, the other similar in action to erepsin. *G. Denigés* shows that the "milk" of *coconut* is very rich in an active *oxydase* and that it contains much *choline*. *S. Cotton* has isolated a colouring body in a crystalline condition from normal *urine*.

M. Hanriot considers the *colloid* forms of the various *metals* to be salts of a peculiar acid. *O. Le Compte* gives a method for preparing *iodoform* from acetone. *H. Cousin* has continued his investigation of the chloro-compound found in commercial aristol

and finds it to be *di-thymol di-chloride*. *F. Roques* and *A. Gerngross*, commenting on *Cousin's* work, show that much valuable iodine is lost by the process in which hypochlorites are employed. The determination of *cantharidin* has attracted some attention, processes being published by *Puran Sing* and by *E. Léger*. *C. Phisalix* and *G. Bertrand* have isolated two poisonous bodies, *bufotalin* and *bufotenin* from the toxic secretion of the common toad. *Milk*, according to *F. Landolph*, contains a hitherto undescribed carbohydrate, *lactosin*. An important research is being conducted at the Imperial Institute on the toxic principles of certain fodder plants which have proved fatal to stock in the Colonies. Already valuable results have been obtained, showing that, in certain cases, the poison is due to the presence of a cyanogenetic ferment ; further reports on the subject are promised. *E. Bourquelot* and *H. Hérissey* have succeeded in obtaining *gentiobiose* in a crystalline condition, and the first-named author has investigated the action of ferments on this sugar. *C. Vallée* has demonstrated the presence of *saccharose* in the *almond*, and discusses the part it plays in the formation of oil. *C. Tanret* has found two *new sugars* in *manna*, and has further investigated *stachyose*. *E. Bourquelot* treats of the *hydrolysis of polysaccharides* by soluble ferments. *J. Bougault* and *G. Allard* have shown that *volemite* occurs in several members of the N. O. *Primulaceæ*. *F. W. Traphagen* and *E. Burke* confirm the fact that salicylic acid is a normal constituent in many fruits. *H. Henriet* has found that the *air* contains a new *organic compound* in the state of vapour.

General analytical chemistry has been enriched by many useful processes. *S. Zeisel* contributes a method for the determination of *cellulose*. The details published by *T. E. Thorpe* and *E. Holmes* for the determination of *alcohol* in essences and medicinal preparations is of special importance, since its adoption should obviate the discrepancies which have occurred between two analysts, using different methods, in the determination of alcohol in these preparations for the purpose of claiming "draw-back" from the Excise authorities on exported articles. *G. Argenson* gives a method for the determination of minute quantities of *alcohol*. *E. Bechmann* furnishes a method for the quantitative determination of *fousel oil*. *Sanglé Ferrière* and *P. Cuniasse* show how the presence of *methyl-alcohol* may be detected in liqueurs. *Gavard* gives a general reaction for *alcohols ; Manget* and *Martin*, for *aldehydes*. Thio-semicarbazide

is employed by *M. Freund* and *A. Schander* as a general reagent for *aldehydes* and *ketones* with which it forms definite and distinctive compounds.

O. E. Bell publishes a new and delicate test for turmeric, using diphenylamine as the reagent. *A. Kaiser* employs amyl-sulphuric ether to detect *wood pulp* in paper. The determination of *phenols* in pharmaceutical preparations has occupied the attention of *E. Barrel*. *J. Pouget* gives a rapid method for the assay of *oil* in olives, which may find useful application to other substances. *A. Trillat* treats of the determination of *glycerin* in wine, employing acetic ether as the solvent. *A. D. Buisne* has devised a new *gasometric method* for the determination of *glycerin*. *H. Schiff* and *A. Pfaff* give two methods for the determination of *formaldehyde*. *G. Frerichs* describes a method for determining the percentage of *mercuric chloride* in surgical dressings. *R. Michonneau* finds that the presence of *phenol* in creosote may be determined by means of the addition of glycerin. *P. W. Squire* and *C. M. Maines* treat of the characters of *glacial acetic acid* and show that the melting point of the pure acid, as given by Rudolph, is too high. *F. H. Alcock* and *W. Wilkins* direct attention to the distinctive behaviour of *phenacetin* with sulphuric acid. *S. Harvey* advocates the employment of *iron alum* in the colorimetric determination of *salicylic acid*. *F. Telle* gives a scheme for the rapid analysis of *soap*. *G. Denigés* shows how *organic nitrogen* may be determined without distillation or gasometry. *J. E. Saul* uses ortho-methyl-amido-phenol sulphate as a reagent to differentiate *raw* from *cooked milk*, also for the detection of *formaldehyde* in milk. *Feldmann* gives a modification of *Loewenthal's* method for the determination of *tannin*. In urinalysis, *E. Ehrlich* employs di-ethyl-amido-benzaldehyde as a reagent for *indican*. *Nakayama* and *Badouin* both give tests for the presence of *bile* in urine. *Manget* and *Marion* recommend di-amidol-phenol, or amidol, as a reagent for *ammonia* in *water*, instead of *Nessler's* reagent. Two new indicators for use in alkalimetry deserve notice—iron *isopyrotritarate*, as recommended by *L. J. Simon*, and *rubrescine*, used by *A. Rosenfeld*.

Under the heading of inorganic analytical chemistry, the general indefiniteness of the Pharmacopœial tests for foreign metals, notably lead, as pointed out by *A. J. Cownley*, may be noted. *A. de Jong* employs an ethereal solution of stannous chloride for the application of *Bettendorf's* reaction for *arsenic*, which may be useful under some conditions. *C. E. Cassel* and

H. Germans publish a noteworthy process for the determination of *boric acid. F. M. Perkin* gives a simple test for the detection of *bromides, iodides* and *bicarbonates* in mixtures.

Now that so many arsenical organic preparations are used in medicine, the distinctive reactions for *cacodylic acid* and *cacodylates* given by *J. Bougault* should prove useful. *R. Carter White* shows that *cobalt nitrate* is somewhat neglected as a reagent in simple analysis, and *Duyk* recommends the use of *nickel* in place of copper as a reduction test for sugars. *P. A. E. Richards'* practical note on the assay of *dental alloys* may prove of service to pharmacists. *W. Garsed* shows by what means correct results may be obtained when titrating *sodium sulphite* with N/10 iodine solution. *E. J. Mills* gives a practical hint as to the value of *bromine water*, instead of nitric acid, as an oxidizer in the analysis of metallic salts.

The number of new "remedies," the novelty of many of which is confined to the fancy title with which they are adorned, continues to increase. Many of these, being merely proprietary medicines foisted upon the notice of therapeutists and pharmacists as "synthetic" preparations, are unworthy of notice. Among the more prominent of more or less value which have been reported on during the past year, the following may be mentioned: *Acetyl chloride*, stated to be a digestive stimulant; *aphthisin*, a guaiacol-sulphonic compound, used as a disinfectant for the respiratory organs; *arheol*, said to be an alcohol of sandal oil, probably merely santalol under a new name; *methyl-atropine*, which will probably be of real service, since the objectionable properties of atropine are stated to be much modified by the process of methylation; two salts of this, the *bromide* and the nitrate, the latter under the name "*eumydrine*," have been introduced; *benzoyl-acetyl peroxide*, an intestinal disinfectant for enteric fever; *carbol-lysoform*, stated to be less toxic than phenol and more active than lysoform; *ektogan* or zinc peroxide; *epiosine*, a morphine derivative, a sedative and hypnotic; *formane*, chlormethyl menthyl-ester, a remedy for coryza; *gallogen*, or ellagic acid, an astringent: *guaiasanol*, or diethyl glycocol-guaiacol hydrochloride, a disinfectant, liberating guaiacol under the influence of alkali; *helmitol*, a hexamethylene-tetramine compound; *hopogan*, a mixture of magnesia and magnesium peroxide; *iodocresin*, which, under the name of "*traumatol*" was introduced as a surgical disinfectant, and is now stated to be useful for internal medication; *mercury iodo-cacodylate*, stated to be more suitable for use than mercury

cacodylate; *mesotane*, the methyl oxy-methylic ester of salicylic acid, a remedy for rheumatism; *methyl acetyl-salicylate*, employed for the same purpose; *methyl iodide*, forming a useful vesicant; *nargol*, or silver nucleinate; *oresol*, the monoglycerol ester of guaiacol; *pyranum*, benzoyl-thymol-sodium benzoyloxy-benzoate, a remedy for neuralgia and migraine; *new sidonal*, or quinic anhydride; *sodium di-iodo-salicylate*, an iodoform substitute; *sulpho-guaiacine*, or quinine sulpho-guaiacolate; *theocine*, a synthetic theophylline, for which valuable properties as a diuretic are claimed; *tachiol*, silver fluoride, a powerful bactericide; *veronal*, diethyl-malonyl urea, a new hypnotic; and *zinol*, a mixture of zinc acetate and alumnol, used as a urethral disinfectant.

W. E. Dixon has found *apocodeine hydrochloride* to be a useful laxative when given hypodermically. *F. W. Tunnicliffe* confirms the value of *phenol-phthalein* as a harmless and efficient purgative. *Calcium peroxide* or "gorite" maintains its reputation as an intestinal disinfectant; *Bonnet* advocates the use of *chloral hydrate* as a vesicant. Both *picric acid* and *guaiacol* have been recommended as applications for the eruption of smallpox; the latter has been found to be of undoubted value by *J. J. Ridge*. *Levulose* has again attracted favourable attention from its nutritive value. *A. J. Kelly* emphasizes the value of full doses of *alcohol* in the treatment of *phenol poisoning*, a fact which should be noted by pharmacists, who often are required to give "first aid" in such cases.

Chielin, a viscous extractive from tulip bulbs, has been favourably reported on as a dressing. *F. Kraft* has isolated an active principle, *filmaron*, from male fern rhizone. An infusion of *Viola tricolor* is stated to be useful as an application to acne. *Hydrastis canadensis* has been used with success in renal hæmorrhage by *W. Bramwell*, and by *W. Cuthbertson* in the treatment of enlarged thyroid. *Eucalyptus leaves* are claimed as a specific for glycosuria; *Equisetum arvense* is found to possess valuable hæmostatic properties; so has *Bryonia alba*. *E. M. Holmes* and *J. C. Umney* describe *cativo*, an oleoresin allied to the copaibas. *G. Heyl* has found a new alkaloid, *delpho-curarine*, in *Delphinium scropulorum*. A new bitter tonic has been reported on favourably, derived from *Castela nicholsoni* bark. *E. Heckel* communicates a note on the highly toxic komanga bark, *Erythrophlæum couminga* of Madagascar. *W. R. Dunstan* finds no *strychnine* and only a little *brucine* in *Strychnos rheedii*. *P. Lemaire* has examined the bark of *Richeria grandis*, a reputed aphrodisiac, and

found it to contain no alkaloíd, nor other physiologically active substance. *D. Hooper* describes the Indian subterranean fungus *Mylitta lapidescens*. *Rhubarb* has been further investigated by *A. Tschirch* and *K. Heuberger*, who finally summarize their results and revise the nomenclature of the active principles. *E. Gibson* finds *cinnamic* acid and three crystalline *tannins* in rhubarb, while *S. Jakabhazy* compares the emodin and chrysophanic acid value of *Chinese* and *European* roots. *Podophyllum resin* has received attention at the hands of *S. Taylor*, and also from *A. R. Bennett*, while *H. M. Gordin* and *C. G. Merrell* read a paper, on the same subject, before the *American Pharmaceutical Association*. *D. B. Dott* usefully again raises the question as to the constituents of the resins of *Podophyllum peltatum* and *P. emodi* and suggests further investigation of both. A *new kino*, from *Eucalyptus drepanophylla*, is reported on by *C. Mannich*, who also describes several new *gums* brought from Africa by the Busse expedition. *E. Bourquelot and H. Hérissey* apply the knowledge gained in their work on the constituents of *gentian root* to the consideration of the commercial drug, and show how profoundly these constituents are modified by the method of fermenting and drying employed. *E. M. Holmes* publishes some further details with reference to *Cannabis indica*. *G. Watt* contributes a useful note on the botanical sources of *Indian aconite roots*.

Histological pharmacognosy has been enriched by the valuable series of papers on the *microscopical characters of powdered drugs* published by *H. G. Greenish and E. Collin*. *P. E. F. Perrédès* has reported on the anatomy of the stem of *Derris uliginosa*; *T. E. Wallis* deals with the structure of *Japanese chillies*.

On the subject of the *standards for purity* and of the *active principles of drugs and medicines*, *J. C. Umney* has contributed an important paper, which has given rise to valuable discussion. *C. Ahrens* and *P. Hett* give a method for determining the presence of *added resin* in *liquid storax*. *E. Dowzard* shows that the amount of *free acid* in *sublimed sulphur* varies within wide limits. *A. Chwolles* gives a modification of *Kreis's* test for the differentiation of *peach kernel* and true *almond oil*. *J. Schindler* shows how *Bombay mace* may be detected when mixed with *Banda mace*. *A. B. Lyons* reverts to the well-worked subject of the determination of *resin* in *jalap*. *A. G. Patterson* gives figures for the amount of ash in *ipecacuanha*. *H. Thoms* publishes a scheme for the valuation of drugs and narcotic

extracts, and issues a warning against attributing undue importance to the presence of any one substance in the standardization of drugs. *H. Ziegenbein*, in this connexion, shows the determination of *digitoxin* to be valueless as an indication of the therapeutic value of *fox-glove leaves*. *W. Braeutigam* gives a method for the assay of *extract of colocynth*. The characters and tests of *cod liver oil* are dealt with by *Ciupercesco*, *E. Bourquelot*, and *C. E. Sage*. *R. Berg* demonstrates the effect of bleaching on the analytical "constants" of bees-wax, and *H. Beckhurst* has contributed a valuable paper on the *alkaloidal assay* of certain drugs. In view of the reputed value of *Lacnanthes tinctoria* as a remedy for pulmonary tuberculosis, the preliminary chemical examination of the drug by *J. A. Gardener* is not without interest.

The section of pharmacy shows a greater number of practical papers than usual. The *incompatibility* of *senega infusion* with *codeine* is dealt with by *Ciupercesco;* that of *pyramidon* with *acacia mucilage* by *P. Tanzi;* of *protargol* with *alkaloidal salts* by *Combe;* of *cocaine hydrochloride* with *ammoniated mercury* by *M. Jean*, and of the same alkaloidal salt with *borax* by *Manseau;* while the action taking place between *borax* and *chloral hydrate* is dealt with by H. *Meurin*. *R. Rosseau* shows that decomposition takes place in mixtures of *aspirin* and *sodium bicarbonate*.

Yvon gives a process for the preparation of an active *cinchona wine; Warin* deals with the production of a *fluid extract of cinchona* of maximum alkaloidal and extractive value. *J. P. Gilmour* criticizes the official processes for the *liquid extracts of cinchona and coca;* suggests that cochineal should be used to determine the neutrality of *ammonium acetate solution;* gives improved modifications for the formulæ or *modus operandi* in the preparation of *syrup of codeine phosphate*, *mucilage of acacia*, *liquid extract of cascara*, *camphor liniment*, *magnesium carbonate solution*, *syrup of calcium lactophosphate*, and, in conjunction with *H. Rodwell*, of *resin* and *soap plasters*, and *basic lead acetate solution*. *W. Lyon* gives improved methods for preparing *ammoniated tinctures of ergot*, and *of guaiacum*, and advocates the use of glycerin as a preservative for *solution of iron acetate*. *H. Deane* modifies the process for preparing *syrup of calcium lactophosphate*. *W. H. Lenton* criticizes the official directions for the preparation of *fluid extracts of coca* and *cimicifuga*, and of *liniment of aconite*, suggesting lessening the quantity of menstruum for maceration, previous to percolation. *W. Carter*

White and *J. G. C. Lock* publish a method for preparing a *fat free nux vomica* preparations. *H. J. Henderson* criticizes the process for preparing *compound syrup of hypophosphites B.P.C.* and the *Strong solution of ferrous hypophosphite B.P.C. H. A. B. Dunning* suggests the use of *phosphorated resin* for the pharmaceutical manipulation of phosphorus. *W. Duncan* has examined the composition of *Donovan's solution*; *J. Humphrey* has traced the history and development of the formula for *Blaud's pills*. *F. H. Alcock* and *H. W. Green* find that the *deposit of pyrethrum tincture* is a potassium phosphate. *A. W. Hudson* would substitute air-dried for kiln-dried hops in the preparation of *tincture of hops*. *P. Boa* finds the official *compound tincture of gentian* to be too bitter, and suggests lessening the amount of gentian. *E. White* shows that the *gelatinization of kino tincture* is due to a ferment which may be destroyed by heating the fresh tincture on the water bath. *A. Claret* advocates the addition of *borax* to *iodine tincture* as a preservative. *T. S. Barrie* suggests that a determination of the basicity should be added to the tests for *basic lead acetate solution*. *H. Skinner* publishes two formulæ for *soapy preparations of iodine*. *H. Carter* emulsifies *liquid extract of male-fern* by means of senega tincture. As usual, numerous formulæ for emulsions and preparations of *cod liver oil* have been published. *A. Terson* strongly advocates the use of *olive oil* as a vehicle for *collyria*. *W. Chattaway* finds that *dilute acetic acid* and *vinegar of squills*, exposed to the air, undergo no diminution in acetic acid strength. *E. Dufau* gives a method for the preparation of *red mercuric oxide* by precipitation, the product being an impalpable powder free from grittiness and very suitable for ophthalmic pharmacy. *H. Lajoux* deals with the preparation of *mercuric salicylate*. *Catillon* discusses the solubility of *iodine* in *glycerin*, while *P. W. Squire* and *C. M. Caines* give results on the determination of the solubilities of *ammonium phosphate* and *zinc sulpho-carbolate*. *Maurel* advocates the employment of *beeswax* as an excipient for drugs intended for intestinal action, and *Yvon* gives directions for *keratin coating* of pills.

Notes on the pharmacy of *adrenaline* have been published by *D. Black*. *H. Brocadet* deals with the pharmacy of *colloidal silver*; that of *hermophenyl* is given in *L'Union Pharmaceutique*; *Boisse* deals with compounds containing *libanol*; *Renzi* gives typical prescriptions for *ichthyol*; and *Novikow* treats of the dispensing of *hydrogen peroxide*.

The International Conference for Unification of the Formulæ

of Potent Medicines have issued suggestions for the nomenclature and dosage of active drugs and their preparations.

We have reproduced some formulæ from the new *Pharmacopœia of St. Thomas's Hospital*, and also a selection, published in the *Chemist and Druggist*, from formulæ employed in the *British Naval Hospitals;* these will be of interest to pharmacists.

A collection of formulæ, which relate to subjects of interest to pharmacists, or which appear to be of practical value, is given as usual. It will be understood that these, gathered from current pharmaceutical and technical literature, are offered as much as suggestions, as actual recipes to be followed. Without direct experiment, it is not possible to vouch for the value of each formula; but the practical pharmacist should have little difficulty in modifying those which do not meet his needs, so as to adapt them to his requirements.

It will be noted that, in many instances, when the subject under discussion has been treated of previously, reference is made to notes in former volumes of the *Year-Book.* It is hoped that these back references will be useful to those who are seeking for information on the matter referred to.

CHEMISTRY.

17 C

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Acacia farnesiana, New Constituents of the Essential Oil of. (*Schimmel's Report*, April, **1903**, 17.) Decyl aldehyde, cumic aldehyde, and probably geraniol and linalol are recorded as constituents of the essential oil of "Cassie" flowers. Methyl salicylate, also a ketone with a violet-like odour, and benzyl alcohol have been previously found in this essential oil. (See also *Year-Book*, **1901**, 17.)

Acetic Acid, Glacial, Laboratory Notes on. P. W. Squire and C. M. Maines. (*Pharm. Journn.* [4], **15**, 413.) Having noticed that the glacial acetic acid of commerce varies a good deal in quality, some experiments were instituted for the purpose of recording the results of samples obtained from different manufacturers and dealers. Ten samples were collected, each of which was supplied to an order for *Acidum aceticum glaciale B.P.* 1898. They were examined as follows:—

Melting Point.—The apparatus consisted of a thermometer graduated to degrees Centigrade (the scale measuring about a degree to an inch), by which the temperature could be easily read to 1/10th of a degree. A beaker 4 in. high filled three-quarters full of water containing some lumps of ice. Two test tubes, each 4 in. long and ½ in. wide. The method employed was that of cooling the liquid acid to a temperature some degrees below that at which it could be made to solidify, and subsequently pouring the cold liquid into the second test tube (cooled to the same temperature) containing the thermometer and a crystal of pure acetic acid. Almost immediately the liquid began to crystallize and the temperature rose quickly to a definite point, at which it remained until liquefaction took place. This method is found to give more uniform results than that of compelling the liquid to crystallize and subsequently watching for the melting point, although tolerably good results were obtained by this latter method.

SPECIFIC GRAVITY.—The specific gravity was taken with a Westphal balance at 15·5°C. (60°F.).

TITRATION TEST.—An indefinite quantity (about 1 Gm.) was weighed and dissolved in 50 c.c. of water, the titration conducted with N/10 soda solution, of which 150 c.c. was added at once, and the remainder run in from a burette in the usual manner. The indicator was phenol-phthalein. In order to detect any error which might be caused by the presence of carbonate in the soda solution, a separate titration was conducted, using N/10 barium hydroxide solution, with practically the same results. The sole objection to using decinormal in place of normal soda is the large bulk required, but the first portion can be added from a pipette, when it is very little more trouble than the normal solution. The advantage of using the more dilute solution is very considerable when the accuracy is considered. It is extremely difficult to obtain a reading with normal soda to less than 0·1 c.c., which is equivalent to nearly 0·6 per cent. of $C_2H_4O_2$, whereas the same amount of decinormal solution represents only 0·06 per cent. With normal soda the reading is so coarse as to be of no value in the case of glacial acetic acid, for which B.P. gives no margin whatever, but requires it to contain 99 per cent. and to neutralize 16·6 c.c. of volumetric solution of sodium hydroxide.

PERMANGANATE TEST.—Two c.c. of the sample was diluted with 10 c.c. of water, and N/20 potassium permanganate solution was added until a pink colour was produced, which lasted half a minute. The figures in the table show the quantity over and above the initial drop required to give a pink colour. Relatively corresponding results were obtained from the samples by the use of the ammoniacal silver nitrate test, but they do not readily admit of quantitative expression.

TURPENTINE TEST.—Five c.c. of oil of turpentine was shaken with 5 c.c. of the sample of glacial acetic acid, both being at a temperature between 58° and 62°F., and noted as to whether separation took place in twelve hours. The samples of oil of turpentine were described in a previous paper (*Pharm. Journ.* [4], **14**, 512), and the glacial acetic acid samples are as in table on next page.

As regards this table, the points which call principally for notice are that only No. 1 sample had a melting point in conformity with B.P., and only No. 1, No. 2, No. 3, and No. 4 conformed to the permanganate reaction.

No. of Sample	1	2	3	4	5	6	7	8	9	10
Specific gravity at 15·5°C. (=60°F.)	1·054	1·054	1·058	1·060	1·054	1·055	1·052	1·057	1·057	1·058
Melting Point	15.7°C. =60·3°F.	15·3°C. =59·6°F.	14·6C. =58·3°F.	13·5°C. =56·2°F.	12·2°C. =54·0°F.	12·6°C. =54·7°F.	13·5°C. =56·2°F.	11·5°C. =52·7°F.	11·1°C. =52°F.	11·4°C. =52·4°F.
Titration Test. Weight of acid taken =	1·0620 Gm.	1·0585 Gm.	1·0600 Gm.	1·0100 Gm.	1·0795 Gm.	1·0500 Gm.	1·0600 Gm.	1·0425 Gm.	1·0660 Gm.	1·0680 Gm.
No. of c.c. N/10 NaHO required	177·6 c.c.	177·0 c.c.	176·0 c.c.	167·4 c.c.	178·4 c.c.	174·3 c.c.	176·6 c.c.	171·4 c.c.	178·5 c.c.	174·2 c.c.
Weight of acid found =	1·05814 Gm.	1·05456 Gm.	1·048608 Gm.	0·99736 Gm.	1·06290 Gm.	1·03848 Gm.	1·05218 Gm.	1·02120 Gm.	1·06350 Gm.	1·03788 Gm.
Pe centage =	99·7 p.c.	99·6 p.c.	98·9 p.c.	98·7 p.c.	98·5 p.c.	98·9 p.c.	93·3 p.c.	97·9 p.c.	99·8 p.c.	97·2 p.c.
Permanganate Test. Approximate No. of c.c. N/20 $KMnO_4$ required over and above the first initial drop to 2 c.c. acid diluted with 10 c.c. of water	nil	nil	0·05 c.c.	0·05 c.c.	1 c.c.	1 c.c.	3 c.c.	4 c.c.	8 c.c.	3 c.c.
Turpentine Test. 5 c.c. sample mixed with 5 c.c. of each of the oils of turpentine mentioned below. A B C D E F G H	 clear clear clear clear clear clear clear clear	 clear clear clear clear clear clear clear clear	 clear clear clear clear clear clear clear clear	 separated separated separated separated separated clear separated clear	 clear clear clear clear clear clear clear clear	 clear clear clear clear clear clear clear clear	 clear clear clear clear clear clear clear clear	 separated separated separated separated separated clear separated separated	 clear clear clear clear clear clear clear clear	 separated separated separated separated separated clear separated separated

The authors are unable to obtain an acid having the melting point 16·7°C. ascribed by Rudorff to pure hydrogen acetate. (*Berichte*, **3**, 390.) The highest melting point obtained from fractional crystallization of pure acid was 16·5°C. This result confirms that of Petersen (*Journ. Prakt. Chem.*, **24**, 296), who finds the melting point to be 16·55°C. It would appear, therefore, that the figure given by Rudorff is 0.2°C. too high.

Achillea millefolium, Essential Oil of. A. B. Aubert. (*Journ. Amer. Chem. Soc.*, **24**, 778.) The oil examined, distilled in Europe, had the sp. gr. at 22°C. 0·9217. Under reduced pressure 86 per cent. distilled over between 170°–235°C. All the fractions were more or less acid in reaction, and all were blue in colour. The portion distilling between 210–220°C. resembled solution of cupric sulphate in tint; that coming over between 220–235°C. was much deeper in colour, but of a greenish shade. The blue distillate 210–220°C., which formed the major fraction, equivalent to 50 per cent. of the original oil, was redistilled. The greater part boiled at 214°C. (under reduced pressure). On keeping, its colour changed to yellowish green. It had the $[\alpha]_D = -14{\cdot}2°$; refract. ind. 1·492; b.p. 254°C. at 754·8 mm. Analysis gave figures corresponding to the formula $C_{12}H_{20}$. It is apparently closely related to the terpenes. It is not identical with the blue constituent of chamomile oil. The first fraction, b.p. 170–190°C. contains a little cineol and a trace of an aldehyde.

Adlumia cirrhosa, Alkaloids of. J. O. Schlotterbeck and H. C. Watkins. (*Proc. Amer. Pharm. Assoc.*, **50**, 332.) The first work done upon this biennial plant was reported two years ago (*Year-Book*, **1901**, 17). Only a small quantity of the root of the first year's plant was obtainable, and the presence of protopine was established. As the investigation promised to be fruitful in results, the work was continued upon the entire plant of second year's growth. The dry, ground drug was moistened with water containing a small amount of ammonia. This liberated the alkaloids from their salts. After drying, without heat, the drug was exhausted with chloroform, the chloroform recovered, and the alkaloids extracted from the chloroformic residue with warm, very dilute acetic acid. The acid solutions were concentrated, precipitated with ammonia, and shaken out with ether. By repeated fractional crystallization five bases were separated, viz.:—Protopine, $C_{20}H_{19}NO_5$; β-homochelidonine, $C_{21}H_{23}NO_5$; adlumine, $C_{39}H_{41}NO_{12}$; adlumidine, $C_{30}H_{29}NO_9$, and a fifth base in very small quantity, with a melting

point of 176–177°C. Citric and tartaric acids were also separated from the plant.

Alcohol, Determination of, in Essences and Medicinal Preparations. T. E. Thorpe and J. Holmes. (*Proc. Chem. Soc.*, **19**, 13.) The following method is recommended for the determination of ordinary alcohol in essences and medicinal preparations containing essential oils and volatile substances, such as ether, chloroform, benzaldehyde, camphor, and compound ethers, in preparations for which "drawback" is claimed from the Inland Revenue, on exportation. It has been used for some time past in the Government Laboratory, and has been found to be both accurate and of very general applicability. Twenty-five c.c. of the sample, measured at 15·5°C., is mixed with water in a separator to a bulk of from 100–150 c.c., and common salt is added in sufficient quantity to saturate the liquid. The mixture is now shaken vigorously for five minutes with from 50–80 c.c. of light petroleum boiling below 60°C., and after standing for about half an hour the lower layer is drawn off into another separator, extracted, if necessary, a second time with petroleum, and then introduced into a distillation flask. Meanwhile, the petroleum layers are washed successively with 25 c.c. of saturated brine, the washings added to the main bulk, which is neutralized, if necessary, and then distilled, and the distillate made up to 100 c.c., and its relative density determined at the standard temperature in the usual manner. The results thus obtained require a small correction from the circumstance that, as the alcohol present is distilled into four times its initial volume, the errors of the spirit tables are necessarily quadrupled. The mean error of the tables at below 40 per cent. proof (for example, 0·972 sp. gr.), may be set down as +0·2 per cent. of proof spirit, and hence the observed determinations, expressed as percentage, of proof spirit, require a substractive correction of 0·8 per cent.

Alcohol in Extreme Dilutions, Determination of. G. Argenson. (*Bull. Soc. Chim.* [3], **29**, 1000.) A reagent of fuchsine, decolourized by SO_2, is first prepared thus. Twenty-five Cgm. of fuchsine is dissolved in 500 c c. of water previously boiled; on cooling, a slow current of SO_2 is passed through, the passage of the gas being stopped before decolourization is complete. If after standing for some hours there be still a slight tint, a few more bubbles of gas are passed and the solution again left. The operation is repeated until a solution is obtained, having a just perceptible

rose tint when observed in bulk. The reagent thus prepared is extremely delicate for aldehydes. If the passage of gas be carried too far, a straw-coloured liquid is obtained which is not nearly so sensitive.

The method depends on the conversion of the alcohol present into aldehyde, which then restores the colour to the decolourized fuchsine reagent. A preliminary determination is made with a solution of alcohol of known strength, say 1 : 500,000. Twenty c.c. is taken and treated, in a flask, with 5 c.c. of saturated solution of $K_2Cr_2O_7$ and 1 c.c. of H_2SO_4. The flask is connected with a Liebig's condenser by a tube, the vertical portion of which carries 2 or 3 bulbs, to act as a splash trap during distillation, which is then slowly conducted and always under the same conditions. The first 5 c.c. of distillate is collected, treated with 0·5 c.c of the reagent, when the colouration attains its maximum in about an hour. The colour is then matched by means of N/100 potassium permanganate solution, which is run from a burette into 5 c.c. of water placed in a tube similar to that containing the distillate. The colour value of the alcoholic solution of known strength thus obtained, the operation may be repeated on dilutions of unknown alcohol content. If the amount of alcohol in the original solution exceed 1 : 200,000 it should be diluted.

Alcohols, Action of on the Sodium Derivatives of other Alcohols. M. Guerbet. (*Comptes rend.*, **135**, 172.) Having previously shown that primary alcohols, when heated above 220° with their sodium derivatives, form condensation alcohols in accordance with the formula $C_nH_{2n+1}OH + C_nH_{2n+1}ONa = C_{2n}H_{4n+1}OH + NaOH$, it is now shown that an analogous reaction may take place between one alcohol and the sodium derivative of another, thus: $C_mH_{2m+1}OH + C_nH_{2n+1}ONa = C_{m+n}H_{2(m+n)+1}OH + NaOH$. When sodium is heated in a mixture of ethylic and œnanthylic alcohols condensation takes place between the sodium œnanthylate and the ethylic alcohol thus: $C_7H_{15}ONa + CH_3.CH_2OH = C_7H_{15}.CH_2.CH_2OH + NaOH$, forming normal nonyl alcohol, $C_9H_{20}O$; and when propyl alcohol is substituted for ethylic alcohol the product is the decylic alcohol, $C_{10}H_{22}O$, which is methyl-8-nonylol-9 alcohol. It is an oily colourless liquid, having the sp. gr. 0·8333 at 15°C.

Aldehydes, New Reaction for. Manget and Marion. (*Annales de Chim. Analyt.*, **8**, 207, and *Comptes rend.*, **135**, 584.) Amidol or amidophenol form very sensitive reagents for the

presence of aldehydes, with which they give a marked colour reaction. This is more evident if the substance to be tested be first mixed with a little warm milk and then a few small crystals of amidol be sprinkled on the surface of the liquid. A yellow colour soon appears, which should not be mistaken for the salmon pink reaction given by pure milk. This reaction is obtained with formaldehyde, ethylic, anisic, benzoic, cumic, salicylic and vanillic aldehydes, and with piperonal. It is not given with valeric aldehyde nor with glucose. It forms a convenient method for the detection of formalin in dietetic articles, a proportion of 1:50,000 being rendered evident by this colour reaction.

Alcohols and Allied Bodies, New Reaction for. Gavard. (*Journ Pharm. Chim.* [6], **17**, 374.) If, on a solution of 5 to 20 per cent. of KNO_2 in H_2SO_4 sp. gr. 1·846, a little ether be floated, so as not to mix the liquids, an intense blue colour will be seen to form in a few minutes, which pervades the whole liquid, disappears on shaking, but reappears on standing. This disappearance and reappearance may be obtained many times in succession. The temperature most favourable for the reaction is from 15 to 30°C. At −20°C. no colour is formed even after two hours' contact. Many alcohols and bodies allied thereto give the reaction; for instance: formalin, acetone, ethyl aldehyde; methyl, ethyl, amyl, propyl, butyl and benzyl alcohols; many esters; sorbite, mannite, saccharose, glucose, levulose, and many other substances. With solid bodies, a fragment should be floated on 1 or 2 c.c. of the reagent, and then, before charring can take place, 1 or 2 c.c. of water should be added at once; but solids do not generally give so sharp reactions as liquids.

Alkaloids, the Solubilities of. W. Mueller. (*Apoth. Zeit.*, **18**, 208.) The solubility of vegetable bases in various immiscible solvents employed in alkaloidal assays is a matter for extreme importance to the analyst. The author has determined the solubility of certain of the most important of these and compiled the following table, the figures in which were determined by agitating the powdered alkaloid with the solvent for three hours at 18–22°C., evaporating a weighed quantity of the solution and weighing the residue; they represent the parts by weight of solvent necessary to dissolve, part by weight of alkaloid.

M.Pt.	Alkaloid.	Ether Sp. gr. 0·720.	Ether Sat. with Water.	Water Sat. with Ether.	Benzol Sp. gr. 0·885.	Chlorof Sp. gr. 1·487.	Acetic Ether Sp. gr. 0·900.	Pet. Spt. b.p. 59–64°C. Sp. gr. 0·663.	CCl_4 Sp. gr. 1·599.	Water.
85°–86°	Aconitine, amorph.	69·4	58·9	570·4	< 1	< 1	< 1	4237·9	50·2	1845·7
114–115	Atropine, cryst.	45·8	26·95	67·5	25·05	1·47	25·8	1211·7	151·2	56·1
176–177°	Brucine, cryst.	133·5	1446·1	467·4	90·1	< 1	23·5	1140·5	1286·4	1775·8
167°	Quinidine, cryst.	128·8	61·4	8247·7	40·8	< 1	56·8	4155·3	177·0	4943·0
172°	Quinine hydrate (6·37 H_2O)	61·7	17·8	1497·8	486·9	< 1	21·5	9750·7	491·6	174·2
173°	Quinine, anhyd.	114·2	35·8	1176·9	58·8	< 1	40·5	4729·3	189·0	1975·7
201°	Cinchonidine, cryst.	474·5	191·3	8266·3	1010·2	10·75	330·0	2103·1	1967·0	8918·8
236°	Cinchonine, cryst.	1000·8	811·4	3985·1	1838·8	148·3	1390·0	2985·9	2770·0	4182·6
98°	Cocaine, cryst.	8·62	2·94	394·4	1·0	< 1	1·69	42·2	<1	563·3
126–128°	Colchicine, amorph.	796·2	554·2	8·8	106·5	< 1	74·5	1737·1	829·6	10·4
132°–133°	Hydrastine, cryst.	197·3	125·9	2608·8	11·25	< 1	24·7	1366·1	810·9	3000·0
108·5	Hyoscyamine, cryst.	49·5	25·55	82·0	130·0	< 1	20·4	1018·8	1722·7	281·5
243–244°	Morphine, cryst.	7632·1	10622·0	2239·0	1599·1	1525·5	587·2	1170·7	6896·4	3532·8
265°	Strychnine, cryst.	2817·4	1951·7	6023·3	129·9	< 1	507·0	10715·5	682·0	4804·2

The following appear to be the best solvents for removing the various alkaloids from their aqueous solutions:—

Alkaloids.	Solvents.
Aconitine, amorphous	Benzol or acetic ether.
Atropine, crystalline	1, Benzol; 2, Acetic ether.
Brucine, crystalline	Acetic ether.
Quinidine, crystalline	Benzol.
Quinine, hydrate	1, Ether saturated with water; 2, Acetic ether.
Quinine, anhydrous	1, Ether saturated with water; 2, Acetic ether.
Cinchonidine, crystalline	Ether saturated with water.
Cinchonine, crystalline	Ether saturated with water.
Cocaine, crystalline	1, Benzol; 2, Acetic ether.
Colchicine, amorphous	1, Water saturated with ether; 2, Water.
Hydrastine, crystalline	Benzol.
Hyoscyamine, crystalline	Acetic ether.
Morphine, crystalline	Acetic ether.
Strychnine, crystalline	Benzol.

Almonds, Presence of Saccharose in, and its Physiological Function. C. Vallée. (*Comptes rend.*, **136**, 114.) In the first stage of the development of the almond the author finds that a constant afflux of reducing sugars and saccharose takes place in the pericarp. Afterwards these carbohydrates accumulate in the nucleus, where they take part in the formation of oil. It is found that as the proportion of oil in the nucleus increases, the relative amount of reducing sugars diminishes, as oil or saccharose makes its appearance. Saccharose increases in quantity until oil begins to form; it then diminishes gradually, and finally again increases when the activity of the oil-formation ceases. In the pericarp the proportions of saccharose and reducing sugars remains relatively constant. No oil is found therein.

Aloes, Barbados, Soluble Glucoside in. E. Aweng. (*Apoth. Zeit.*, **22**, 422.) The aqueous-soluble portion of aloes contains a red body which, by the action of acids, is split up into a sugar, a substance which is identical with emodin, and another compound which closely resembles rhamnetin. Soft aqueous extract of aloes is extracted with alcohol 95 per cent.; the alcohol solution is treated with one-third its volume of petroleum ether, when it

throws down a greyish violet precipitate. The filtrate leaves, on distillation, a reddish residue which gives oxyanthraquinone reactions with alkali. This compound, by boiling with HCl, is hydrolized into a sugar and a brown product closely resembling pseudo-emodin isolated from buckthorn bark. It is a combination of emodin and a body giving a yellow solution with alkalies. These two bodies may be separated by prolonged treatment with HCl and alcohol or by means of bromine.

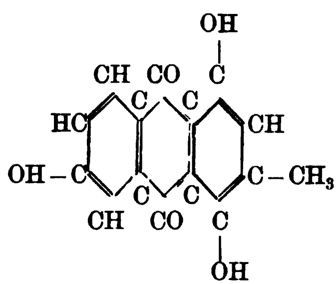
The portion of aloes insoluble in water, when extracted with alcohol, yields a pseudo-emodin which closely resembles the emodin in the water soluble portion.

Aloins, Constitution of; Barbaloin and Isobarbaloin. E. Léger. (*Journ. Pharm. Chim.* [6], **16**, 519; *ibid.*, 592; **17**, 52.)

Barbaloin. The best method of obtaining barbaloin free from isobarbaloin is to treat it several times in succession with copper sulphate and sodium chloride, as in applying Klunge's reaction. (*Year-Book*, **1901**, 40.)

By oxidizing pure barbaloin with sodium dioxide, three products have been obtained—methylisoxychrysasin, identical with the aloe-modin of Tschirch and Oesterle; formic acid; and a colourless syrup.

Methylisoxychrysasin, $C_{15}H_{10}O_5$, crystallizes from methyl alcohol in orange yellow needles, m.p. 224·5–225·5°C. Its constitution may be represented by the graphic formula



Methylisoxychrysasin tetrachloride, $C_{15}H_6Cl_4O_5 + H_2O$, is obtained by treating a solution of chloro-barbaloin in alkaline aqueous solution, with Na_2O_2, on the water bath. The reaction takes place in a similar manner to that with barbaloin, but requires some hours for completion, whereas with barbaloin it is almost

instantaneous. When crystallized from methyl alcohol it forms fine orange-red brilliant needles which melt at 228–230°C. On acetylizing this body it forms *triacetyl methylisoxychrysasin*, $C_{15}H_3(C_2H_3O)_3Cl_4O_5$; this crystallizes in lemon-yellow needles, m.p. 270–271°C.

Methylisoxychrysasin tetrabromide, $C_{15}H_6Br_4O_5$, is obtained by acting on bromobarbaloin with Na_2O_2.

Formula of Barbaloin. The results obtained have induced the author to abandon the formula $C_{16}H_{16}O_7$ for barbaloin, and $C_{16}H_{13}Cl_3O_7$ for its chloro-derivative, since the production of bodies, apparently pentoses, from barbaloin requires a more complex formula. Besides, the formation of the compound $C_{15}H_6Cl_4O_5$ from chlorobarbaloin is not easily reconciled with the formula $C_{16}H_{13}Cl_3O_7$ for the latter. The optical activity of barbaloin, also, shows that it cannot be, as hitherto supposed, an anthraquinone derivative. It is proposed that the formula $C_{21}H_{20}O_9$ should be adopted, which would make barbaloin isomeric with frangulin.

Barbaloin tetrachloride, $C_{21}H_{16}Cl_4O_9 + 1\frac{1}{2}H_2O$, is obtained by adding $KClO_3$ to a solution of barbaloin in strong HCl. When recrystallized from alcohol, 90 per cent., it forms clinorhombic prisms having the appearance of rhomboid tablets. When heated in a sealed tube to 100°C. with excess of benzoyl chloride, it forms *pentabenzoylbarbaloin tetrachloride*, $C_{21}H_{11}(C_7H_5O)_5Cl_4O_9$, in yellow non-crystalline grains.

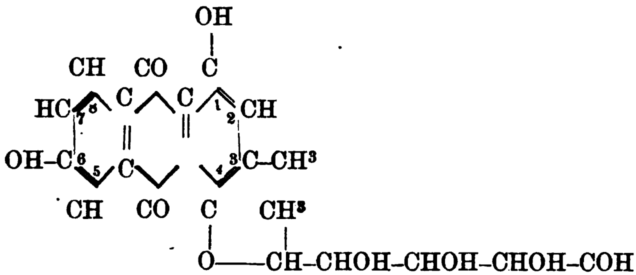
Tribromobarbaloin, $C_{21}H_{17}Br_3O_9$, is obtained by the action of Br on barbaloin in HBr, sp. gr. 1·5. After four days in contact the mixture is poured into water. The yellow powder thus obtained, is dissolved in boiling alcohol, deposits a micro-crystalline precipitate on cooling.

Tetrabromobarbaloin, $C_{21}H_{16}Br_4O_9$, results from the action of bromine water on barbaloin in aqueous solution. Crystallized from alcohol, it forms felted yellow needles, which is distinguished from the corresponding tetrabromide of isobarbaloin by its extreme solubility in alcohol 90 per cent.

Isobarbaloin. Isobarbaloin accompanies barbaloin in Barbados, Curaçao and Jafferabad aloes, and is most abundant in the last named. It preponderates in the later fractions when crystallizing aloin from methylic alcohol. It is purified by several recrystallizations from that solvent, but since it forms molecular compounds with barbaloin, it is never obtained quite pure in this

manner. If a solution of the two aloins in methylic alcohol be distilled, and the process be interrupted from time to time so as to obtain fractional crystallizations, a point is reached when cauliflower tufts of crystals form on the sides of the flask; these are composed of more or less pure isobarbaloin. Under the lens, the component crystals appear as lengthened truncate lamellæ. Isobarbaloin may be represented by the formula $C_{21}H_{20}O_9$; it crystallizes from methylic alcohol with 4 mols. H_2O, and from water with 3 mols. H_2O. Its solution in pyridine gives a dibenzoyl derivative, $C_{21}H_{18}(C_7H_5O)_2O_9$ with benzoyl chloride. Like barbaloin, it yields methylisoxychrysasin with sodium dioxide. Its acetic ether solution is lævo-rotatory $[\alpha]_D = -19° 4$; but in water this rotation is destroyed and it even shows indications of dextro-rotation. It gives a red colour with HNO_3 in the cold, as it is much more readily oxidized than barbaloin. It is this product of oxidation which furnishes the colour in Klunge's reaction which that author erroneously attributed to barbaloin. *Isobarbaloin tetrachloride*, $C_{21}H_{16}Cl_4O_9 + {}_5H_2O$, crystallizes from alcohol in prismatic, bright yellow needles, quite distinct from those of barbaloin tetrachloride. *Isobarbaloin tetra bromide*, $C_{21}H_{16}Br_4O_9$, is the compound which has been described by previous workers as bromobarbaloin. The aloins they have used have been mixtures of barbaloin and isobarbaloin, which, being brominized together, yielded a mixture of barbaloin and isobarbaloin tetrabromides. The latter compound, being much less soluble in strong alcohol, has been obtained in crystals which have been regarded as "bromobarbaloin." (Compare *Year-Book*, **1901**, 27, 28, 86; **1902**, 29.)

Constitution of Aloins. Since aloin and isobarbaloin give, with Na_2O_2, the same oxidation product, methylisoxychrysasin, and since the chloro-derivatives of both these aloins give the same methylisoxychrysasin tetrachloride, it is clear that they contain a common nucleus. Both give chrysammic acid when treated with HNO_3, and both evolve furfural when heated. In addition to methylisoxychrysasin, both aloins give another body with Na_2O_2. When methylisoxychrysasin is precipitated with HCl, an oily liquid is obtained from the solution, which presents all the characters of an aldopentose. It would appear therefore that barbaloin may be considered to be a condensation product of methylisoxychrysasin with a methylaldopentose. This may be represented by the constitutional formula—



In the more stable barbaloin the sugar chain is attached to the carbon atoms 1 or 4; while in isobarbaloin it is attached to the carbon atom 6, leaving free the two hydroxyl molecules at 2 and 4. This will explain the ease with which isobarbaloin is oxidized, and the red colour reaction obtained with it under the influence of laccase by Bertrand, according to whom only phenols with HO groups in the ortho and para positions are attacked by this ferment. Moreover, the occurrence of the hydroxyl in the ortho-position cannot be doubted, since it is there found in chrysasin, which is a derivative of synthetic aloins obtained from anthracene. Another OH molecule cannot be placed at 2, because in that case methyl-isoxychrysasin would be fixed on cotton mordanted with alum, which is not the case. All the hydroxyl derivatives of anthraquinone containing the hydroxyl atoms in the ortho- or para-positions are, without exception, colouring bodies.

Barbaloin and isobarbaloin appear therefore to be isomers of frangulin, but the latter is a true glucoside, hydrolized by acids, whereas the aloins are not so acted on. They are, in fact, true ethers.

Aloins of Natal Aloes. E. Léger. (*Journ. Pharm. Chim.* [6], **17,** 13.) Subsequent investigation has caused the author to abandon the formulæ $C_{15}H_{16}O_7$ and $C_{16}H_{18}O_7$ previously (*Year-Book*. **1901,** 27) adopted for homonataloin and nataloin, and to now write homonataloin as $C_{22}H_{24}O_{10}$ and nataloin $C_{23}H_{26}O_{10}$. Natal aloes are first freed from resin by treatment with acetone; the crude aloins are then recrystallized from methyl alcohol and separated as previously described (*ibid.*) by fractional crystallization.

Nataloin is less soluble in methyl alcohol than barbaloin; it is almost insoluble in boiling water and in ether. It presents phenolic characters, combining with alkaline hydrates, and being re-liberated by treatment with CO_2. Heated with dilute H_2SO_4 it

gives off vapours which redden aniline acetate paper, indicating the presence of furfural. On treating a pyridine solution of nataloin with benzoyl chloride, tetrabenzoyl-nataloin, $C_{23}H_{22}(C_7H_5O)_4O_{10}$, is obtained as an amorphous body free from bitterness, very soluble in alcohol and ether. This body heated with an excess of benzoyl chloride in a sealed tube takes up two more benzoyl groups form-hexabenzoyl-nataloin, $C_{23}H_{20}(C_7H_5O)_6O_{10}$. This is deposited from absolute alcohol in yellowish non-crystalline grains. Sodium dioxide reacts on a warm aqueous alkaline solution of nataloin to form the methyl ester of a new emodin, which is named *natalo-emodin*, $C_{16}H_{12}O_5$. It crystallizes from methyl alcohol in pale orange prisms, m.p. 238°C.; it sublimes in yellow needles. It gives a magnificent violet colour reaction with strong H_2SO_4 and an orange-red colour with NaOH solution. Heated with zinc dust it gives a hydrocarbon, probably a methyl-anthracene, which sublimes in fine scales with a greenish reflection. By heating in a sealed tube to 170°C. with HCl, methyl-natalo-emodin is converted into natalo-emodin, which crystallizes from methyl alcohol in long slender, deep orange-red needles, which give a currant-red reaction with H_2SO_4 and a violet colour with NaOH.

Homonataloin gives combinations and reactions analogous to the above; its $[\alpha]_D = -112°6$, while the rotation of nataloin is $[\alpha]_D = -107{\cdot}7°$. The two following reactions are common to both these aloins. A solution in sulphuric acid, treated with MnO_2 or $K_2Cr_2O_7$ gives a fine green colour; a solution in caustic soda gradually assumes a violet colour on adding ammonium persulphate. This colour dyes silk, but is not fixed by a mordant on cotton.

α-Naphthol, Detection of in β-Naphthol. Arzberger. (*Journ. Pharm. Chim.* [6], **17**, 253, after *Pharm. Post.*) Three decigrammes of the β-naphthol to be examined is dissolved in 2 or 3 c.c. of alcohol, then added to 10 or 15 c.c. of water. The mixture is shaken occasionally for 15 minutes, then filtered and treated first with 10 or 12 drops of 10 per cent. KOH solution, and finally, with 1 to 4 drops of a concentrated solution of iodine in KI. If any α-naphthol be present a violet colour reaction will result with 1 : 500 of that body.

Amber Oil, Empyreumatic. (*Schimmel's Report, April*, **1903**, 8.) Authentic rectified amber oil has the following characters: Sp. gr., 0·9259 to 0·926; $[\alpha]_D + 22° 32'$ to $+26°$; refraction index, 1·50802 to 1·51083; acid number, 5·1 to 6·5; ester number, 3·85 to 8·95. These

figures are the extremes of five different distillations, all of which were soluble in 4 to 4·5 volumes of alcohol 95 per cent. They had not, however, the bright yellow colour which is characteristic of "*Ol. Succini*" as met with in English pharmacy. Four samples of this product had characters which ranged from sp. gr., 0·8835 to 0·8941; $[\alpha]_D - 1° 55'$ to $+12° 55'$; refraction index, 1·46367 to 1·48863; acid number, 2·1 to 12·7; ester number, 2·7 to 6·0. All these were more soluble in alcohol 95 per cent. than those of known origin. The marked lower specific gravity and rotation indicate that the English samples contain a greater percentage of low boiling constituents. The reason of this divergence is being investigated.

Ambrette Seeds, Essential Oil of. (*Schimmel's Report*, *Oct.*, **1902**, 9.) The volatile oil of *Hibiscus abelmoschus*, as usually met with, is concrete at ordinary temperatures, due to the presence of an odourless fatty acid, probably palmitic acid. The oil, when freed from this inert constituent, does not solidify, and has a much more powerful odour. Its sp. gr. is 0·909; $[\alpha]_D + 1° 10'$; acid number, 2·4; and ester number, 180·5. It is soluble in 5 to 6 volumes of alcohol 80 per cent.

Ammonio-manganic Di-pyrophosphate, New. P. Barbier. (*Comptes rend.*, **135**, 1109.) Precipitated manganese dioxide 1 is heated with di-ammonium phosphate 4, and sufficient water to form a paste. The mixture is heated, with constant stirring to drive off the water, then more strongly to fuse the salt. Ammonia is evolved and the mass assumes a violet colour. Sufficient syrupy H_3PO_4 is then added to moisten the whole mass, and heating is continued until the substance acquires a fine violet colour. After cooling, the excess of phosphoric acid is removed by washing with cold distilled water; the pulverulent residue consists of the new salt, which has the formula $Mn_2(NH_4)_2P_4O_{14}$, or manganese ammonio-dipyrophosphate.

Anise Oil, Adulteration of. E. Tardy. (*Journ. Pharm. Chim.* [6], **16**, 322.) It is considered that the least indication of dextro-rotation, in either star-anise or pimpinella anise oil, demonstrates admixture with fennel oil stearoptene. If any considerable amount of this adulterant be present, the presence of the fenchone may be established by the fractional distillation of the solid portion of the oil. Since the fruits of *Illicium religiosum* contain eugenol, whereas those of *I. anisatum* do not, the presence of that phenol in star-anise oil will suffice to indicate admixture of the two fruits before distillation. Eugenol

may be detected by shaking out the oil with aqueous caustic alkali, liberating the dissolved eugenol with acid, and oxidizing it into vanillin by means of bichromate mixture.

Anthesterin, a New Vegetable Cholesterol in Anthemis nobilis. T. Klobb. (*Bull. Soc. Chim.* [3], **27**, 1229.) Anthesterin, $C_{28}H_{48}O$ or $C_{29}H_{50}O$, a new cholesterol compound, has been isolated from the capitula of *Anthemis nobilis.* The flowers were extracted by macerating for 15 to 20 days in light petroleum ether, the liquid concentrated to about 1/50th its volume, and allowed to stand when the greater part of the anthesterin crystallized out, leaving the anthemene of Naudin in the mother liquor. The separated crystals were purified by maceration in cold acetone and treated with benzoyl chloride, being converted into benzoylanthesterin, $C_{28}H_{47}O.C_7H_5O$ or $C_{29}H_{49}O.C_7H_5O$; it crystallizes in leaflets from $CHCl_3$ or CCl_4; m.p. 284 – 286°C.; sublimes without decomposition, and is insoluble in cold alcohol. On saponifying this, pure anthesterin is obtained, which crystallizes from a mixture of benzol and alcohol in feathery tufts of fine needles, or by slow crystallization from a mixture of benzol, alcohol, acetic ether and chloroform, in prisms; m.p. 221–223°C.; it sublimes unaltered. With strong H_2SO_4 it gives an orange-red colour; with H_2SO_4 containing 1 per cent. of crude nitric acid, a brownish red, becoming purple red. On evaporating anthesterin with a little HCl and Fe_2Cl_6 and taking up the residue with $CHCl_3$ a violet colour is obtained. It gives a permanganate violet colour with Liebermann's reaction; with the Salkowski-Hesse reaction, the H_2SO_4 layer is at first orange, then reddish brown with a greenish fluorescence, the $CHCl_3$ layer remains colourless.

Antipyrine, Two New Salts of. A. Reychler. (*Bull. Soc. Chim.* [3], **27**, 612.) *Antipyrine hydrochloride*, $C_{11}H_{10}ON_2HCl$, is obtained by dissolving antipyrine 30, in a mixture of alcohol 50, and strong HCl 30, and evaporating to dryness on the water bath; the residue is treated several times in a similar manner. The product is washed with alcohol-ether and ether, and dried over H_2SO_4. It forms thick, deliquescent tables, m.p. 158–160°C, very soluble in water. The aqueous solution has a markedly acid reaction. When crystallized from a mixture of benzol and alcohol it separates in flat prisms with 1 mol. of benzol of crystallization, $C_{11}H_{10}ON_2.HCl.C_6H_6$.

Antipyrine dextro-camphorsulphonate, $C_{11}H_{12}ON_2.C_{10}H_{15}OSO_3H$, separates from a solution of molecular equivalents of dextro-

camphorsulphonic acid and antipyrine. Recrystallized from a mixture of acetone and alcohol it forms non-deliquescent prisms, m.p. 166°C., soluble in water and alcohol; the former solution is strongly acid, the latter neutral.

Apomorphine, Detection of in Morphine Hydrochloride. Helch. (*Pharm. Post.*, through *Pharm. Centr.*, **44**, 95.) The substitution is recommended of a 5 per cent. solution of potassium bichromate for the potassium carbonate solution generally employed. The reaction obtained is sharper, and there is no loss of time, since oxidation of the apomorphine is quickly accomplished by the bichromate. One drop of the reagent is added to 5 c.c. of a 1 : 30 solution of the morphine salt. On shaking out with chloroform, that solvent removes and is coloured by the characteristic reddish violet oxidation product if so little as 0·03 per cent. of apomorphine be present.

Apomorphine, Preparation of the Crystalline Base and Constitution of. R. Pschorr, B. Joeckel and H. Fecht. (*Berichte*, **35**, 4377.) Apomorphine, as the free base, has not hitherto be obtained in the crystalline form. The authors have succeeded in obtaining it in this condition by crystallizing it from absolutely dry ether, under an atmosphere of CO_2. From this solution it separates in colourless crystals combined with one molecule of ether, thus: $C_{17}H_{17}NO_2.(C_2H_5)_2O$. The ether is eliminated by heating the crystals to 100°C. *in vacuo*. The crystals are not very stable.

The question of the structure of the apomorphine molecule is elaborately discussed, the conclusion being supported by practical experiments. The supposed analogy of apomorphine to morphine, in which one atom of oxygen is attached to an hydroxyl group, the other taking part in an ether molecule, is shown not to exist. Both the oxygen molecules are united to phenolic hydroxyl groups. Apomorphine is considered to be built up on a phenanthene nucleus.

Arsenic, Action of, on Copper. A. Granger. (*Comptes rend.*, **613**, 1397.) Arsenium easily combines with copper; when its vapour is carried over that metal in a current of an inert gas, a brittle white metallic mass is formed which melts at a red heat. When the reaction is conducted in an atmosphere of sulphur and CO_2 at 440°C. copper arsenide is produced in a crystalline form, having the composition Cu_5As_2. This is identical with the greyish deposit formed on copper foil in applying the familiar Reinsch's test, but in this case the arsenide is amorphous. Crystalline Cu_5As_2 occurs

in well-formed, small, steel-grey crystals with a bluish reflection and metallic aspect, tarnishing in the air; they belong to the cubical system, and have the sp. gr. 7·56. They are soluble in HNO_3, and are readily oxidized by chlorine, bromine and nitro-hydrochloric acid. These crystals may be obtained at a temperature below the b.p. of sulphur, but with less facility, since, unless the compound is maintained in the presence of excess of arsenium vapour, it parts with that element, and a product approaching more or less the formula $CuAs_3$ is formed, which is considered by some authors to be the composition of the amorphous arsenide. The same compound results from the action of arsenic chloride on copper, or of arsenium on copper chloride, but the preparation is more troublesome than with the direct combination of the elements. Copper gives a compound with phosphorus corresponding to the formula Cu_5P_2, but this combination takes place at a higher temperature than with arsenic.

Phosphides richer in phosphorus than Cu_2P_5 may be obtained, but the author has not succeeded in isolating analogous arsenides. By the method described, no arsenide richer in arsenium than Cu_5As_2 could be obtained.

Arsenic, a Test for. A. de Jong. (*Zeitschrift für analyt. Chem.*, **41**, 598.) Stannous chloride is found to be soluble in ether, so that an ethereal solution of the salt is available for the application of Bettendorf's test for arsenium. The reagent may be prepared by dissolving stannous chloride 25, in ether 100, and adding 20 parts of HCl; after standing, the clear liquid is decanted. To detect arsenic, equal volumes of the reagent and of the suspected liquid are mixed and warmed for a minute to 40°C. If 0·02 Mgm. of arsenium be present, a reddish brown ring will be formed at the juncture of the two liquids.

Arsenic, Distribution of in Nature. A. Gautier. (*Comptes rend.*, **135**, 833.) Arsenic is found to be universally distributed in the animal kingdom, being localized specially in organs of ectodermic origin; the skin and its appendages, the thyroid gland, the thymus, the mammary glands, the brain and the bones. It is not present, however, or at least not to the extent of 1:20,000,000, in the other parts of the body and its secretions. It is not present in ordinary blood, but is found in the menstrual discharge. In the plumage of birds, it is only found in the down which covers certain portions of the body, and which corresponds to the hair of mammals. It occurs in some feathers, but is narrowly localized.

Thus it is not found in the plumage of the peacock, but is present in the barbs of the eyes of the large feathers of the train of that bird, and is not found in the shafts. It would appear to be strictly confined to that portion of the plumage of birds the growth and colour of which are influenced by the sexual function.

In the vegetable kingdom, arsenic is found in those species which are rich in iodine. Among the Algæ, *Fucus vesiculosus* contains 1·59 parts per million, and *F. digitatus* 2·08. Fresh water algæ such as *Spirogyra* contain 0·40 parts per million, and *Cladophora* 0·08. Boghead coal is specially rich in arsenic, that of Autun giving no less than 20 to 25 parts per million, while Australian boghead coal contains 3 parts. It also occurs in the algæ which are found in sulphureous springs, in sea water, and in primitive rocks.

Arsenic in Eggs. G. Bertrand. (*Comptes rend.*, **136**, 1083.) The author does not consider that the presence of arsenic is limited, as stated by A. Gautier, to certain organs, but is of opinion that it exists universally in the animal cell, like carbon, sulphur or phosphorus. In support of this theory he has demonstrated its presence in all parts of the egg of the domestic hen. Eggs from fowls kept for several generations in confinement in Paris were found to have a mean content of 0·005 Mgm. of arsenic per egg. Although the metalloid was found in all parts, the yolk contained most, from half to one third the total arsenic being therein. The white contained but little; the skin, although weighing little relatively to the other parts, was very rich in arsenic; 0·15 Gm., or one integumental membrane of an egg afforded sufficient to give a fine arsenical ring. In this respect the author confirms Gautier's assertion, that the epidermal cells and appendages, or those parts which represent them are normally richer in arsenic weight for weight than most other parts of the animal body.

Arsenic Pentachloride. C. Baskerville and H. H. Bennett. (*Journ. Amer. Chem. Soc.*, **24**, 1070.) By passing dry chlorine over crystals of $AsCl_3$ contained in a tube surrounded by solid CO_2 and cooled to $-35°C.$, then distilling off the liquefied chlorine by allowing the temperature to rise to $-31°C.$ the authors have succeeded in forming $AsCl_5$. The greenish yellow liquid so produced is readily soluble in CS_2 or Et_2O, cooled to $-30°C.$; from the latter, when chilled several degrees, it crystallizes in yellow prisms. On exposure to the air it fumes, evolving HCl, and as the temperature rises deposits crystals, probably of $AsCl_3$. These speedily melt.

When cooled in sealed tubes to -38 or -40°C. it forms fine yellow crystals.

Artemisin, Reduction Products of. P. Bertolo. (*Atti R. Accad. dei Lin. Roma* [5], **11,** 486, through *Chem. Centralb.* [2], **72,** 369.) By allowing artemisin to stand for 8 days at 0°C. in contact with a solution of $SnCl_2$ in fuming HCl saturated with HCl gas, a reduction product is formed, having the formula $C_{15}H_{18}O_3$. It crystallizes from alcohol or acetic ether in small white hard needles melting at 269–270°C.; it is soluble in alkalies and reprecipitated by CO_2. It gives on boiling with alkalies or alkaline earths, salts of a monobasic oxy-acid; the barium salt has the formula $Ba(C_{15}H_{19}O_4)_2$; the silver salt forms glittering needles. On acidifying the solution of the barium salt with HCl no precipitate is thrown down, but ether removes a viscous substance which becomes crystalline; this is doubtless the liberated acid which is gradually converted into the lactone. On acetylizing this, the acetyl derivative $C_{15}H_{17}O_3.COCH_3$ is obtained, which crystallizes in white shining leaflets or needles; m.p. 205–206°C. which on being boiled with KOH and acidified with HCl are reconverted into the original lactone melting at 269°C. This must therefore contain a phenolic hydroxyl group, which has replaced a CO group in the original artemisin. On being fused with alkali, artemisin, like santonin, is reduced, affording a new reduction product, desmotroposantonin. Artemisin alone does not give this decomposition product. By reducing artemisin with zinc and acetic acid, a dextro-rotatory product m.p. 275°C., which is insoluble in alkalies, is obtained. (Compare *Year-Book*, **1902,** 38.)

Asarum Arifolium, Essential Oil of. Emerson Miller. (*Archiv der Pharm.*, **240,** 371.) The dried root of *Asarum arifolium* yields by steam distillation 7 to 7·5 per cent. of a colourless volatile oil, which becomes at first yellow, then red, on exposure to light. Its odour somewhat resembles that of sassafras; the sp. gr. varies from 1·058 to 1·061. It is lævo-rotatory. It is partially soluble in alkaline solutions, the soluble portion consisting mainly of eugenol, accompanied by a trace of an undetermined phenol. The chief constituents of the oil are found to be: lævo-pinene, eugenol, an unidentified phenol, methyl-eugenol, methyl-iso-eugenol, safrol, asarone, and probably a sesquiterpene. (Compare with constituents of oil of *Asarum canadense*, *Year-Book*, **1902,** 38.)

Atlas Cedar, Essential Oil of. E. Grimal. (*Comptes rend.*,

135, 582.) The essential oil of the Atlas cedar has the following characters: sp. gr. 0·9508 : $[\alpha]_D + 60° 32'$; refractive index, 1,51191; free acid number, 1·16; saponification number, 6·92; acetylization number, 33·84. On fractionation under 16 mm. pressure a trace of acetone was detected in the first fraction. The fraction boiling between 180 and 215°C. at normal pressure was found to contain a new ketone, $C_9H_{14}O$. This has not yielded a crystalline oxime, but on treating it successively with hydroxylamime hydrochloride and bromine, it forms the compound $C_9H_{15}OHBr_2$, which is crystalline and melts at 132–133°C. The fraction boiling between 132–136°C. at 16 mm. consists mainly of cadinene. (See also *Year-Book*, **1901**, 40; **1902**, 162.)

Barium Ammonium and Barium Amide. Mentrel. (*Comptes rend.*, **135**, 1739.) When gaseous ammonia is passed over barium, no action takes place above +28°C. Below that temperature a reddish brown compound is formed, which is transformed into a blue liquid when the temperature falls below −23°C. Towards −50°C. a deep blue oily liquid separates, which is sparingly soluble in liquefied ammonia, forming a pale blue solution. Below −23°C. these compounds are stable; at above −15°C. they are converted into the amide as the temperature rises. The composition of the solid body appears to be $Ba(NH_3)_6$. Moissan has found for the analogous calcium compound, the formula $Ca(NH_3)_4$. It would appear, therefore, that the amount of NH_3 which enters into combination increases with the molecular weight of the element. Barium ammonium takes fire in the air, and is rapidly decomposed by water. It absorbs oxygen at a low temperature. With nitrogen dioxide it forms a solid white barium hyponitrite $Ba(NO)_2$. With CO the ammoniacal solution of barium ammonium forms barium carbonyl, $Ba(CO)_2$, a yellow solid body which decomposes, without explosion, in the air, and is soluble in water without decomposition. By passing gaseous ammonia over barium heated to 280°C., a liquid compound is formed, at first greyish, then green, and finally red. This is barium amide, $Ba(NH_2)_2$. It boils at 460°C., evolving nitrogen and hydrogen. At 650° it forms an orange-red solid which melts at 1000°C. When, on lowering the temperature, and maintaining the current of NH_3, these phenomena are reproduced inversely, the compound becomes liquid at 450°C. and resolidifies at 280°C. These changes are due to the conversion of $Ba(NH_2)_2$ into the nitride Ba_3N_2 and on cooling back again to $Ba(NH_2)_2$. Lithium behaves in a similar manner.

Basil, Essential Oil of; Optical Activity of. *Schimmel's Report, April*, **1903**, 13.) The freshly distilled oil of *Ocimum basilicum* has the rotation, in a 200 mm. tube of +0·35°. On fractionating with steam the first 10 per cent. has the rotation +5°, the residual portion showing the figure −0·6°. When this residue is treated to near its boiling point, about 215°C., and then cooled, it acquires the dextro-rotation +2°; after prolonged heating for several hours this is increased to +3·4°, but proceeds no further. On distilling the residue, *in vacuo*, a fraction with a much lower dextro-rotation is obtained. All the above results refer to experiments conducted in a tube 200 mm. in length.

Bears' Fat, Genuine, Characters of. Lyman, F. Kebler and G. R. Pancoast. (*Proc. Amer. Pharm. Assoc.*, **50**, 363.) Bears' fat is a pale yellow, semi-opaque, oily fluid at summer heat: it solidifies in cold weather. It has a peculiar odour and a bland taste. Its sp. gr. at 15°C. is 0·913; acid number, 3·93; saponification number, 203·4; iodine number, 80·43. It congeals at 9°C.

Benzoin, Products of the Action of Alkali on. E. Knoevenage and J. Arndts. (*Berichte*, **35**, 1982, through *Chem. Centr.* [2], **73**, 367. When benzoin is heated to 100°C. under a long reflux condenser so that atmospheric air is practically excluded, with 28 per cent. KOH solution for ten hours, no marked action takes place. With 40 per cent. KOH solution, however, benzoic acid, benzyl alcohol, together with hydrobenzoin and toluylene hydrate are formed. If benzoin be boiled under an upright condenser with 80 per cent. KOH solution and distilled, benzyl alcohol and a little toluylene hydrate is obtained, while benzoic acid remains in the residue. When the heating is carried to 120°C. with a 67 per cent. solution of KOH in an atmosphere of hydrogen, benzoic acid, benzyl alcohol, hydrobenzoin, and benzyl are produced. With 60 per cent. KOH solution under a long condenser, benzoin, when boiled for six hours, and then distilled with superheated steam, gives chiefly toluylene hydrate. When benzoin is heated to 100°C. with 44 per cent. solution of KOH for ten hours in a nickel crucible, the chief product is benzoic acid, with benzyl alcohol, hydrobenzoin and a little toluylene hydrate. Under the same conditions, with an 80 per cent. solution of KOH, the same products were obtained, in different proportions, together with a substance melting at 100°C., which is probably diethylcarbobenzoic acid, $C_{18}H_{18}O_2$. If the heating be carried to 195°C. less benzoic acid, and more benzyl

alcohol are obtained, the latter containing a little tetraphenylethane. On fusing together benzoin and dry KOH to 240–250°C., benzoic acid, a little benzyl alcohol, desoxybenzoin, benzhydrol, and benzyldesoxybenzoin were obtained. The last is a condensation product of benzyl alcohol with desoxybenzoin.

Bignonia catalpa, the Acids of. A. Piutti and E. Comanducci. (*Chem. Centr.*, **73**, 50, after *Boll. Chim. Farm.*) Sardo has stated that the pods of *Bignonia catalpa* contain a peculiar acid to which the name catalpic acid and the formula $C_{14}H_{14}O_6$ were given. The authors find that this is para-oxybenzoic acid, $C_7H_6O_3$. The unripe pods also yield on extraction with dilute H_2SO_4 and then with ether, a combination of para-oxy-benzoic and proto-catechuic acid, $C_7H_6O_3.C_7H_6O_4 + 2H_2O$, melting at 188–190°C., similar to that obtained by Hlasiwetz and Barth by melting gum benzoin with KOH.

Birch Buds, Essential Oil of. (*Haensel's Quarterly Report, Oct.*, **1902**, 6.) Birch buds yield 6·25 per cent. of a pleasant smelling, dark green essential oil to steam distillation. Its sp. gr. at 20°C. is 0·9592. At the same temperature it has the $[\alpha]_D$ + 6° 25′. The oil is not perfectly clear at 20°C.; at 17°C. it begins to deposit minute crystalline spangles, at 14°C. it becomes thick, and at -45°C. the oil is semi-solid and crystalline. It is very soluble in ethylic or amylic alcohol, ether, chloroform, or acetic ether; it gives a turbid solution with petroleum ether, and is insoluble in glacial acetic acid, carbon disulphide, or in KOH solution.

Bismuth Glycerophosphate. L. Barthe. (*L'Union Pharm.*, **43**, 498.) By mixing a solution of crystalline bismuth nitrate 97 with sufficient HNO_3 to prevent precipitation, and a concentrated aqueous solution of glycerophosphoric acid 52, immediately adding a large excess of alcohol 95 per cent. to the mixture, a copious white precipitate of bismuth glycerophosphate is obtained, which, when washed free from adherent acid with alcohol, responds to the formula

$$\begin{matrix}OH\\OH\end{matrix}\Big> C_3H_5.O.PO \Big< \begin{matrix}O(BiO)\\OH\end{matrix}$$

Bismuth Iodogallate, or Oxyiodogallate, so-called. P. Thibault. (*Journ. Pharm. Chim.* [6], **16**, 145.) The so-called bismuth iodogallate of Frizzi and the oxyiodogallate of Hoffman, Traub, and others, are found not to be definite salts, but mixtures of bismuth tri-iodide and bismuthogallic acid. The proportion of the

constituents varies slightly with the method of preparation. When treated with methyl alcohol or with acetic acid, the bismuth iodide is removed and the residual yellow powder is identified as bismuthogallic acid (bismuth subgallate). Ethylic alcohol 95 per cent. also causes a change, but in this case the residue consists of a mixture of bismuthogallic acid with an oxyiodide of bismuth (Compare *Year-Book*, **1902**, 44.)

Boric Acid, Colorimetric Method for the Determination of. C. E. Cassal and H. Gerrans. (*Brit. Food Journ.*, **4**, 210.) From 15 to 20 Gm. of the sample, such as milk, is made distinctly alkaline with a saturated solution of Ba2HO in a platinum dish evaporated to dryness, well charred, broken up, made just acid with HCl and extracted with successive quantities of hot water, the filtrates being mixed in a 100 c.c. flask. The filter and contents are transferred to the platinum dish, again made distinctly alkaline with Ba2HO, and carefully ashed. The ash is dissolved in a little HCl (1 : 3), the solution and washings added to the first solutions in the flask, and the whole made up to exactly 100 c.c. Ten c.c. of this ash solution is then pipetted on to 10 to 15 Gm. of pure sand, the mixture is made alkaline with Ba2HO solution and evaporated to dryness with occasional stirring. When dry, it is made just acid with HCl (1 : 3), when 2 c.c. of saturated solution of oxalic acid and 2 c.c. of an alcoholic solution of curcumin (1 Gm. per litre) are mixed in. The dish is then placed on the paraffin (or water) bath, covered with a funnel, the stem of which is connected with a set of potash bulbs charged with Ba2HO solution. Air is then gently aspirated through the apparatus until the mass in the dish is dry. An additional 1 c.c. of curcumin solution is then added, well mixed in, and the mass again dried. The dry mass is then extracted with small successive quantities of alcohol or methylated spirit, the solutions obtained being filtered into a flask. When the sand mixture is exhausted of colour the liquid in the potash bulbs is poured upon it and dried, care being taken that it is alkaline with Ba2HO. The mixture is treated as before with HCl, oxalic acid, and curcumin solutions, and the processes of evaporation and alcoholic extraction are repeated. The further yield of coloured alcohol is added to that at first obtained.

A standard colour is prepared by operating 10 c.c. of boric acid solution (1 c.c. = 0·1 Mgm. B_2O_3) in precisely the same manner, the coloured alcoholic extracts being made up to 200 c.c. By

comparing the depth of colour given by the ash solution extracts with this standard, the amount of boric acid in the quantity of solution operated on may be determined, and from that, the amount in the original sample.

Bromides, Iodides and Bicarbonates, a Simple Test for. F. M. Perkin. (*J. S. C. I.*, **21**, 1375.) Alkaline hypochlorites liberate iodine from iodides without the intervention of an acid. Bromine is only liberated by them from bromides in the presence of free acid. This fact enables iodides to be detected in the presence of bromides. The test may be conducted in the following manner—

About 2 c.c. of $CHCl_3$ or CS_2 is added to a little of the aqueous solution of the salt to be tested, in a small separator; a solution of calcium or sodium hypochlorite is then added, drop by drop. If iodine be present, it is immediately liberated, imparting the characteristic violet colour to the immiscible solvent on agitation. If only a small quantity of iodine be present the solution soon becomes colourless in the presence of excess of the hypochlorite, being probably oxidized into iodic acid. As soon as all the free iodine has been eliminated, either by oxidation or by extraction with successive small quantities of the solvent, a few drops of acetic acid are added, when the bromine present is set free. Where the quantity of iodine is extremely minute, the hypochlorite reagent must be added with great care in dilute solution, one drop of which will generally be sufficient, otherwise the iodine is oxidized before it can be detected. The following equation probably represents the reaction which takes place—

$$2KI + Ca(OCl)_2 + H_2O = CaCl_2 + 2KOH + I_2 + O.$$

Bicarbonates, in the presence of hypochlorites and bromides, behave like acids, liberating bromine, whereas normal carbonates have no such action. If therefore 2 c.c. of $CHCl_3$ or CS_2 be introduced into a solution of an alkaline hypochlorite and a little of the solution of the salt to be tested be added, together with a little KBr solution, bromine is liberated if it contains a bicarbonate.

Butylchloral Antipyrine. (*Pharm. Centr.*, **44**, 93, after *Boll. Chim. Farm.*) On rubbing down in a mortar, butylchloral hydrate 10 Gm. with antipyrine 9·7 Gm. and dissolving by the aid of heat the mass thus obtained in an equal volume of water, to which a few drops of strong HCl have been added, yellowish crystals of butylchloral antipyrine, $C_{15}H_{17}ON_2Cl_3$, are obtained, which melt at 70–71°C. and are sublimable. The same body is

obtained by mixing equivalent weights of butylchloral hydrate and antipyrine in hot water, but in white crystals melting at 68–69°C. Its solubility in water at 25°C. is 1 : 15, and it is readily soluble in alcohol, ether, or chloroform. Alkaline solutions have no action on the compound even on warming.

Bystropogon origanifolius, Essential Oil of. (*Schimmel's Report*, *Oct.*, **1902**, 82.) The oil of this Labiate shrub, which is common in the Canary Isles, has an odour recalling that of pennyroyal. It has the sp. gr. 0·9248; $[\alpha]_D = + 2° 27'$; acid number, 0; ester number, 11·1; and after acetylation, 53·83; refractive index, n_D 1·48229. It is soluble in 2·5 volumes of alcohol 70 per cent., and in 0·7 volume of 80 per cent. alcohol. It consists chiefly of pulegone and menthone.

Cacodylic Acid and its Salts, Distinctive Reaction of. J. Bougault. (*Journ. Pharm. Chim.* [7], **17**, 97.) It is found that the solution of sodium hypophosphite in HCl (*Year-Book*, **1902**, 36), recommended by the author for the detection of arsenic in glycerin, is equally serviceable to differentiate between cacodylates and methylarsenates. When a small amount of sodium cacodylate is dissolved in water and added to 10 c.c. of the reagent, and the mixture is set aside for 12 hours in a corked tube, a distinct odour of $As_2(CH_3)_4$ is evident, if only 0.0005 Gm. of sodium cacodylate be present; but no precipitate results. If the amount of cacodylate be increased, a deposit of arsenium is slowly formed on the upper portion of the tube. This gradually increases in quantity. Methylarsenates, under similar conditions, give no trace of cacodylic odour, and the whole of the arsenium present is liberated, forming a precipitate.

To detect cacodylates, especially in the presence of methyl arsenates. 0·20 Gm. of the salt is dissolved in 1–2 c.c. of water, added to 10 c.c. of the hypophosphite reagent, and set aside, corked, for 12 hours. If only 0·0005 Gm. of cacodylate be present a marked odour of $As_2(CH_3)_4$ will be evident.

To detect other arsenical compounds in cacodylates. 0·20 Gm. of the salt is treated as above. Pure cacodylates will give no colour or precipitate, but the presence of 0·0001 Gm. or less of As_2O_3 or As_2O_5 will cause these to appear.

Cade Oil, True, Characters and Adulterants of. P. Kauffeisen. (*Répertoire*, **15**, 151.) True cade oil obtained from the wood of *Juniperus oxycedrus* by destructive distillation is largely adulterated with, or substituted by, the so-called "veterinary cade oil,"

which is nothing but either coal- or wood-tar oil. The following characters distinguish true cade oil: Sp. gr. 0·972; acidity in terms of acetic acid, 0·99 per cent.; incompletely soluble in alcohol 90 per cent.; it contains no furfural nor catechol. Tar oil or false cade oil has the sp. gr. 1·048; acidity as acetic acid, 6·61 per cent; is completely soluble in alcohol 90 per cent. It contains both furfural and catechol.

Furfural may be readily detected by the addition of a few drops of aniline to the aqueous washings of the oil. If it be present, an immediate bright red colour is obtained; with pure cade oil, which contains no furfural, the mixture is at first colourless, and, on agitation and addition of acid, assumes a mahogany brown tint. Catechol may be detected in the aqueous washings by means of the deep brown colour it gives with alkaline chromates or bichromates. The aqueous washings of true cade oil give no such colour.

Caffeine and Theobromine, Determination of, in Cacao. J. Dekker. (*Schweiz. Woch. für Chem. und Pharm.*, **41**, 527, 541, 554.) A review of various methods and original experiment lead to the conclusion that water is the best solvent for the extraction of xanthine bases from cacao. Powdered cacao, 10 Gm. and MgO 5 Gm. are heated with water, 300 c.c., for an hour under a reflux condenser. The mixture is then filtered hot, preferably on a filter pump. The residue is boiled with water 150 c.c. for 15 minutes, and the liquid passed through the same filter. The bulked filtrates are evaporated to dryness with a little clean sand, and, when dry, reduced to fine powder. This powder is boiled with 3 successive 100 c.c.'s of $CHCl_3$, each portion being filtered hot. The solvent is recovered by distillation and the residue, dried for 30 minutes at 100°C., weighed as total alkaloids. In these the caffeine and theobromine may be separated by treating the mixed alkaloids with 50 c.c. of benzol, which will not dissolve more than 0·5 Mgm. of theobromine, but will readily take up all the caffeine. The solvent is left in contact with the bases for 24 hours, with occasional agitation; 25 c.c. is then decanted, evaporated, and the residue, after drying, weighed. This will represent half the caffeine present in the total alkaloids first weighed.

Caffeine and Theobromine, Proportion of in Fresh Kola and Cacao Leaves. J. Dekker. (*Schweiz. Woch. für Chem. und Pharm.*, **41**, 560.) The fresh leaves of *Theobroma cacao*, dried over quicklime and assayed by the preceding method, gave 0·55 per

cent. of theobromine in the young leaves, 0·29 per cent. in those more developed, and but traces in old leaves. The young leaves contained also traces of caffeine.

The leaves of *Sterculia kola*, similarly treated, gave in the young leaves 0·049 per cent. of caffeine and 0·101 per cent. of theobromine, while old leaves gave only traces of xanthine bases. In both cases alkaloids disappear as the leaves develop. In the case of kola, the ratio of caffeine to theobromine is inverse to that existing between those bases in the seed.

Calamintha nepeta, Essential Oil of. P. Genvresse and E. Chablay. (*Comptes rend.*, **136**, 387.) The essential oil of *Calamintha nepeta* is known in Southern France as "marjoram" oil, and is different from the oil of the true marjoram *Origanum marjorana*. When freshly distilled it is a colourless liquid, which gradually becomes yellow on exposure to the air. Its sp. gr. is 0·904; $[\alpha]_D + 18° 39'$. It is found to contain, besides lævopinene and pulegone, a new ketone (calaminthone), which occurs in the fraction boiling between 210 and 220°C., from which it was isolated as the crystalline oxime. It is a mobile colourless liquid, boiling at 208–209°C. under 745 mm., having the sp. gr. at 20°C., 0·930, the $[\alpha]_D + 11° 10'$. The oxime $C_{10}H_{16}:NOH$ crystallizes in silky needles, which melt at 88–89°C. and have the $[\alpha] - 6° 7'$. Its semicarbazide crystallizes in yellowish needles, which melt at 165°C. When treated with nascent hydrogen it is converted into menthol. Pulegone is found in the higher fraction, boiling between 223–225°C., from which it was isolated as the oxime.

Calamus Oil, Composition of. R. Beckstroem. (*Berichte Pharm.*, through *Journ. Pharm. Chim.* [7], **17**, 109. Compare *Year-Book*, **1902**, 51.) Further work on calamus oil shows that it contains free normal heptylic and palmitic acids, removed by shaking out with 2 per cent. sodium carbonate solution; eugenol, removed by 2 per cent. caustic potash; asaryl aldehyde, $CHO.C_6H_2(OCH)_3$, separated as the bisulphite compound; acetic and palmitic acids combined as esters, separated after saponification. On fractionation, a crystalline constituent, calameone, $C_{15}H_{26}O_2$, was isolated. This crystallizes from alcohol in rhombic prisms melting at 168°C.; it is dextrorotatory, the $[\alpha]_D = -8°$ at 26°C. It resembles cineol in general properties. Dilute H_2SO_4 or acetyl chloride dehydrate it, removing 2 mols. H_2O, converting it into the hydrocarbon calamene, $C_{15}H_{22}$. This boils at 144°C. at 15 mm.; its sp. gr. at 23°C. is 0·9124; its rotation $[\alpha]_D = -11° 31'$ at 26°C. Its hydrochloride, $C_{15}H_{22}HCl$,

melts at 108°C. Calameone is converted into calameonic acid, $C_{15}H_{24}O_4$, by the action of $KMnO_4$. It melts at 138°C. and its hydrate, $C_{15}H_{24}O_4H_2O$, at 153°C.

The fractions of a higher boiling point than calameone give, when treated with ether, or petroleum ether, and reduced to a low temperature, crystals of asarone. Another hydrocarbon, having the same empirical formula, $C_{15}H_{22}$, as calamene, but differing from it, is also present in the oil. This boils at 151°C. at 22 mm. Since asarone is considered to be the most important constituent of the oil, and is the only constituent which contains three methoxyl groups, it is suggested that the value of a specimen of oil may be deduced by the result of a methoxyl determination by Zeisel's method. In two samples of oil thus examined the amount of asarone was found to be 7·08 and 7·38 per cent.

Calumba Root, Alkaloids of. J. Gadamer. (*Archiv der Pharm.*, **240**, 450.) The root of *Jateorhiza calumba* contains at least two bases similar to berberine, but not identical with that alkaloid, which does not occur in the root. The calumba alkaloids are quaternary bases of a yellow colour. They are reduceable into colourless tertiary bases, which may be separated by shaking out with ether.

Camphor and Camphor Oil, Production of in Japan. N. Sugiyama. (*Journ. Pharm. Soc. Jap.* [242], **1902**, through *Schimmel's Report, Oct.*, **1902**, 16.) Four varieties of camphor are known in Japan; Joko, Tehuko, mountain, and refined camphor. Joko camphor is Tehuko camphor well dried; mountain camphor is so named from its source of production. Refined camphor is manufactured in the districts of Kobé and Osaka from crude camphor. The camphor exported to Europe and America is chiefly mountain camphor, with some refined camphor. Camphor oil is classified as crude, white, and red oil. Crude camphor oil is obtained by steam distilling chips of camphor wood and separating the camphor which crystallizes from the oily distillate. The oil thus obtained is yellow or brownish, varying in sp. gr. with the origin and age of the trees employed. That produced in the provinces Izu and Kii, and that from older trees, has a higher sp. gr. The sp. gr. ranges from 0·950 to 0·995. W. Ono, of Osaka, gives the following details: Camphor oil was at first employed solely as an illuminant, until it was accidentally discovered that by exposing the oil to a low temperature, a further crop of camphor crystals could be

obtained. By a process of crude fractional distillation the product of camphor was further increased to an average of about 156 lbs. from 40 gallons of crude oil. The residual oil, known as red oil, subsequently acquired a commercial value as a source of safrol.

White camphor oil, obtained by fractionating the crude oil, ranges in sp. gr. from 0·870 to 0·91. It deposits no crystals (safrol) when cooled to −20°C. It boils between 150–190°C., and consists mainly of pinene, phellandrene, cineol, and dipentene, as well as from 3·75 to 8 per cent. of camphor, which has not as yet been effectually separated in the manufacturing process.

Red camphor oil is the fractions of the crude oil which follow after distilling off the white oil. Its sp. gr. ranges from 1·000 to 1·035. It boils between 225–270°C. Its main constituent is safrol with a little eugenol.

To separate the safrol from red oil it is again fractionated, the portions distilling near the b.p. of safrol being collected apart and cooled to a low temperature. Safrol then separates in rhombic crystals, which are collected, melted, and recrystallized, when the pure safrol obtained has the sp. gr. 1·107° at 15°C. and boils between 230–235°C. The yield is about 21 per cent. of the red oil originally employed.

Camphor, Determination of in Camphorated Oil. A. W. Nunn. (*Pharm. Journ.* [4], **15**, 106.) Counterbalance two pairs of filter papers about 9 centimetres diameter, and note the weight of one pair. Into the top paper of one pair place about 0·4 to 0·5 Gm. of olive oil, and, keeping the paper flat, run the oil well over until sufficiently absorbed, place on the top of the second paper (this is to prevent any of the oil soaking through), and place on the scale pan. Treat the second pair of filter papers exactly the same, using the sample of camphorated oil under examination instead of olive oil. Place the pair of papers and camphorated oil in the second scale pan, adding or deducting sufficient camphorated oil to balance the olive oil and papers in the other pan. We now have equal quantities of olive oil and camphorated oil in equally balanced papers. Remove the papers containing the camphorated oil and set aside whilst the weight of the olive oil and papers is taken. Deduct the weight of the papers, and the difference will be the weight of the olive oil, which is also the weight of camphorated oil taken.

Next place a tin box (a 1 lb. jujube tin) over a Bunsen, having on the top of the tin two tin lids turned upside down, and of a rather

smaller diameter than the filter papers. Light the Bunsen, and, when the whole is warm, place one pair of papers and oil on each lid, and, taking care that the heat is evenly distributed, allow them to remain for twenty minutes. At the end of that time take off the papers, cool for about two or three minutes (not longer) and weigh.

It will be found that those papers containing the camphorated oil will be lighter, due, of course, to the loss in camphor; the weights added to restore the balance will be equivalent to the amount of camphor driven off.

No notice need be taken of the loss in the olive oil, as it will be equal in both papers, they being heated under precise conditions. An example will make it clear.

Two pairs of filter paper were counterbalanced.

One pair and olive oil weighed	1·165 Gm.
One pair weighed	0·574 Gm.
Difference, which is the quantity of olive oil taken	0·591 Gm.

Therefore quantity of camphorated oil taken will be the same, i.e., 0·591 Gm.

After heating both pairs of filter papers and oil for twenty minutes and placing again on the balances, the loss of camphor was found to be 0·128 Gm., which works out to 21·65 per cent.

Below are a few results. The accepted percentage of camphor in a genuine sample of camphorated oil is 21·44 per cent.

A sample of oil, carefully prepared, and treated by the above method, gave exactly 21·44 per cent. as the mean of three determinations. A second sample, from a batch made a week previously, assayed 21·313 per cent. A third, derived from a wholesale house, gave 20·083 per cent.

Camphor Oil, Commercial. Edwin Dowzard. (*Chem. and Drugg.*, **61**, 520.) The commercial camphor oils of the present day are entirely different from those which were common fifteen years ago. The more complete extraction of the camphor and the removal of the safrol leaves, as a by-product, a light oil, consisting principally of terpenes. The following figures were obtained in the examination of five oils of different quality. Nos. 1 and 2 are typical light oils of the present day. No. 3 is a fairly good oil. No. 4 is a very good oil; and No. 5 is a first-class oil, but of a quality seldom met with:—

	Sp. Gr.	Rotation (100 mm.)
No. 1	0·8895	+ 23° 38′
No. 2	0·9124	+ 18° 0′
No. 3	0·9260	+ 13° 0′
No. 4	0·9817	+ 18° 52′
No. 5	0·9980	+ 9° 10′

Camphor Oil, Light, as an Adulterant of Essential Oils. E. J. Parry. (*Chem. and Drugg.*, **61**, 520.) The light oil of camphor is used to a considerable extent for the adulteration of the more valuable essential oils, in this way partly superseding the coarser adulterant, turpentine. This is specially the case with peppermint and eucalyptus oils. More rarely samples of wintergreen oil adulterated in this manner have been met with. The present high price of peppermint oil is naturally an incentive to this form of fraud, and the oil should therefore be carefully examined. In some cases, where the oil is exceptionally insoluble, the menthol-content will be found to be much below normal, and fractions may be obtained on distillation below 200–205°C. much larger than is the case with pure oils, which only yield small amounts at this temperature.

Camphor Oil, Some New Constituents of. (*Schimmel's Report, Oct.*, **1902**, 21.) Carvol has been isolated from the higher boiling fractions of camphor oil, as well as eugenol. Another phenol, in addition to carvol, is also probably present in the fraction boiling at 94–99°C. (3 mm. pressure). Among the bodies soluble in dilute alkali, caprylic acid has been identified. Another acid, forming a readily soluble calcium salt, having the formula $C_9H_{16}O_2$, presumably belonging to the fatty acid series, is also present.

Camphorosma monspeliaca, Essential Oil of. Cassan. (*Schimmel's Report, Oct.*, **1902**, 23.) The volatile oil of *Camphorosma monspeliaca* N.O. Chenopodiaceæ, a native of the South of France, is a greenish yellow liquid with an odour recalling that of oil of bitter almonds; it is present in the herb to the extent of about 2 per cent. Its sp. gr. at 17°C. is 0·970; refraction index, $n_D = 1·3724$. It congeals at 4°C. It therefore differs from the oil of the closely related *Chenopodium anthelminticum*. When the plant is distilled with KOH it yields propylamine.

Cantharides, Method for the Assay of. E. Léger. (*Journ. Pharm. Chim.* [6], **17**, 457.) Twenty-five Gm. of powdered

cantharides is introduced into a flask with 125 c.c. of benzol and 2 c.c. of HCl. The flask is corked and maintained at 60–65°C. for three hours with occasional agitation. It is then cooled, when the contents are transferred to a percolation tube, the lower end of which has been closed with a plug of cotton wool moistened with benzol. When the liquid has ceased to pass, the percolate obtained is set aside, and the powder exhausted by further percolation with more benzol. This second percolate is then transferred to a tared distillation flask, and the solvent distilled off on the water bath; the first percolate is then distilled in the same flask. The last traces of benzol are got rid of by immersing the flask up to the neck in the hot water of the bath and blowing in a current of air. After cooling, the green oily residue, in which crystals of cantharidin will be seen floating, is mixed with 10 c.c. of petroleum ether, boiling below 50°C.; the flask is then corked and set aside for twelve hours. The liquid portion is then cautiously decanted on to a small tared filter, previously moistened with benzol, avoiding the transference of any crystals to the filter. The residual crystals are washed with four successive washings of petroleum ether, each of 6 c.c., which are passed through the filter also. The filter is then exposed to the air for a few minutes, and, with the flask and contents, dried in an oven at 60–65°C. for one hour. During drying the flask should be inclined, so as to allow of free circulation of vapour into its interior. At the end of the prescribed time the cantharidin is weighed. The percentage found should not be below 0·4 per cent.

The period of drying is limited to one hour, since the author has found that cantharidin is distinctly, though slightly, volatile at that temperature, so that it cannot be dried to absolute constancy.

Cantharidin, New Method for Determination of. Puran Sing. (*Journ. Pharm. Soc. Jap.*, through *Journ. Pharm. Chim.* [6], **17**, 73.) Twenty-five Gm. of powdered cantharides are treated with a mixture of 10 c.c. of nitric acid in 200 c.c. of water. The whole is then evaporated to dryness on the water bath, a little plaster being added towards the end of the drying. The dried mass is then extracted with chloroform, the solvent distilled off, when on cooling the cantharidin crystallizes out from the yellowish oily residue. This accompanying oil is readily removed by washing with a small quantity of ether or alcohol. The object of

evaporating the powdered "flies" with nitric acid is to partially oxidize the fat and so render it more soluble, and therefore easier to remove from the crop of cantharidin crystals.

An alternative method is that of Nagaï. Twenty-five Gm. of powdered cantharides rendered acid with hydrochloric acid are extracted with chloroform in a Soxhlet. The chloroform residue, after distilling off the solvent, deposits the greater part of the cantharidin in the form of crystals. The oil accompanying these is removed by washing with ether; the ethereal washings are evaporated and the fatty residue saponified with a little soda. The soap thus formed is then treated with a solution of alum, which dissolves out the cantharidin which has been removed with the fat. On concentrating the alum solution this cantharidin separates out, and may be added to the first crop of crystals obtained from the chloroform extract.

Carbon, the Temperature of Inflammation of the Three Varieties of in Oxygen. H. Moissan. (*Comptes rend.*, **135**, 920.) It is found that the temperature at which carbon takes fire in oxygen increases with the degree of polymerization. Diamonds become incandescent at 800–875°C.; graphite between 650 and 700°C.; amorphous carbon between 300 and 500°C.; but in each case this violent reaction is preceded by a quiet combustion, which is slower as the temperature falls. Some forms of amorphous carbon, such as bakers' charcoal, will burn in oxygen very slowly at 100°C.; even in atmospheric air it forms, on prolonged heating at 104°C., a notable quantity of CO_2. With the diamond a slow but distinct combination takes place 100 or 150° below the point at which incandescence occurs. A diamond maintained at 780°C., that is, 20° below its burning point, lost 41·24 per cent. of its weight in four hours. At no point during the combustion of the diamond in oxygen does any de-polymerization take place, and no evidence of the formation of a lower polymer of carbon could be obtained. Graphite affords a slight reaction for CO_2 at 570°C., but wood charcoal combines at a far lower temperature than any other form of carbon.

Cassia, Essential Oil of. E. Kremers. (*Pharm. Review*, **20**, 545.) Cedar oil to the extent of 30 per cent. has been detected among the adulterants of cassia oil. It is found that a mixture of petroleum and resin may be added to cassia oil containing 10 per cent. of alcohol, without affecting its sp. gr. or solubility in 80 per cent. alcohol. An oil containing 80 per cent. of cinnamic aldehyde may still be adulterated with 10 per cent. of foreign

matter, which can only be detected by the examination of the distillation residue.

Catechin. R. Clauser. (*Berichte*, **36**, 101.) One hundred Gm. of powdered catechu in cubes was mixed with an equal weight of quartz and extracted in a Soxhlet with ether until the solvent ceased to give a colour reaction with Fe_2Cl_6. The residue, after distilling off the ether, became somewhat crystalline on rubbing down with a little water. The impure substance, when treated with hot water, left insoluble a yellowish green residue, the quercetin of Etti. After repeated precipitation from aqueous solution air-dried catechin responds to the formula of Kostanecki and Tambor, $C_{15}H_{14}O_6 + 4H_2O$, and melts at 96°C.; dried over H_2SO_4 *in vacuo* it loses 3 mols. H_2O and melts at 176°C. At 100°C. it loses the last mol. H_2O and then melts at 210°C. As found by the above-named investigators, it gave a pentacetyl derivative, $C_{15}H_9O_6(COCH_3)_5$. In the air strong alkalies produced with catechin a dark-coloured oxidation product, the so-called japonic acid, but when atmospheric air was excluded and the reaction took place in an atmosphere of hydrogen, phlorogluiciu was formed. On dissolving catechin in strong ammonia an HO group appeared to be substituted, but although the compound was obtained in a crystalline condition, it was very unstable and did not give concordant analytical figures. Catechin readily forms a condensation product with formaldehyde, in aqueous solution in the presence of a trace of HCl, but not so readily with acetaldehyde; it is indifferent to the higher aliphatic and aromatic aldehydes.

Cellulose, Determination of. S. Zeisel and J. Stritar. (*Annales de Chim. Analyt.*, **8**, 77.) The method is based on the property of the non-cellulose of wood of being rapidly transformed into soluble products by potassium permanganate in the presence of nitric acid. 1–1·5 Gm. of the substance under examination, in a finely-divided state, is allowed to swell in nitric acid; it is then treated, while kept cool and constantly agitated with a 3 per cent. solution of potassium permanganate until the violet colour is persistent, for half-an-hour. This addition of permanganate should occupy about 2 hours. The excess of permanganate is then decomposed, and the precipitated oxide dissolved by the addition of sulphurous acid or of sodium bisulphite and dilute sulphuric acid. The residue is collected, washed, macerated at 60°C. for 45 minutes with solution of ammonia 25 per cent., filtered off, washed first

with hot water, then with alcohol, and finally with ether, dried and weighed.

Cerium Silicide. Sterba. (*Comptes rend.*, **135**, 170.) Ulik has obtained a cerium silicide, to which he attributes the formula Ce_2Si, by the action of electrolysis on the fluorides of cerium and potassium. The author has obtained a crystalline cerium silicide, $CeSi_2$, by fusing together a mixture of cerium oxide and silicon in the electric furnace. The button thus obtained was purified by treatment on the water bath with 5 per cent. KOH solution to remove excess of silicon, and the crystals of $CeSi_2$ remaining were purified by levigation. They form microscopic, steel coloured, very brittle crystals, insoluble in water, which only decomposes them on prolonged contact in the presence of air. Hydrogen does not attack them; fluorine, iodine and bromine combine with them with incandescence; the two latter elements only on heating. Oxidation in the air only occurs on heating; when brought into contact with a flame $CeSi_2$ burns, emitting bright sparks. Sulphur and selenium when heated combine with it with slight incandescence; heated with magnesium in a current of hydrogen, a magnesium silicide is formed, which, when attacked by HCl, evolves spontaneously inflammable silicon hydride. Gaseous HCl attacks $CeSi_2$ with a slight incandescence, aqueous HCl, HF, and other mineral acids decompose it, evolving hydrogen. Alkalies in aqueous solution are almost without action on it, but when fused they combine with incandescence; ammonia has no action. $CeSi_2$ melts in the electric furnace, forming a silvery mass.

Ceyssatite. Fournet. (*Le Monde Med.*, through *L'Union Pharm.*, **43**, 562.) Ceyssatite, which is an infusorial earth that has been recommended for pharmaceutical use, and is prescribed in certain dermatological applications, is a variety of raudanite or tripoli which is met with in the neighbourhood of Ceyssat, Puy-de-Dôme. It contains 87·2 per cent of silica, 2 per cent. of Al_2O_3 and Fe_2O_3, and 10 per cent. of H_2O, with traces of organic matter. It is, in fact, a variety of kieselguhr.

Cholesterol, New Reaction of. E. Herschsohn. (*Pharm. Centr.*, **43**, 357.) When cholesterol is heated with a 9 per cent. solution of trichloracetic acid, the crystalline structure is broken down, and at first no colour reaction is given. In a few hours, however, a violet tint appears, which increases in intensity, until, in 12 hours, the mixture acquires a deep violet-red colour. One Mgm. of cholesterol is sufficient to give a very marked reaction with 10 drops of trichloracetic acid solution. On heating,

the colour is developed much more rapidly; it is first of all fluorescent red, then violet, and finally, after 24 hours, deep blue. The reaction is due to the trace of HCl formed by the action of water on trichloracetic acid; and is obtained with greater vividness by adding HCl to the trichloracetic acid solution. On boiling, an intense fluorescence, comparable with that given by eosin solutions, is obtained.

Chromosantonin. C. Montanari. (*Berichte*, **33**, 2346.) The yellow body, chromosantonin, which is formed by the action of light on santonin, is found to be isomeric with that body, having the same empirical formula, $C_{15}H_{18}O_2$. It differs from santonin merely in solubility and rotatory activity. It possesses the same properties of a lactone or ketone as santonin, but is more readily oxidized. It appears to differ from santonin solely in the position of the double bonds between the carbon atoms and the hydronaphthalic nucleus. By repeated recrystallization chromosantonin may be reconverted into santonin.

Chromium Silicides. P. Lebeau and J. Figueras. (*Comptes rend.*, **136**, 1329.) By heating silicon, in various proportions with copper and chromium, a series of silicides of the latter metal have been obtained, $SiCr_3$, $SiCr_2$, Si_2Cr_3 and Si_2Cr. Of these, only Si_2Cr_3 is quite new; but although De Chalmont was the first to prepare Si_2Cr, he was not able to isolate it in a state of purity. The silicide $SiCr_3$ is produced with the minimum amount of silicon. The fused button obtained, after alternate treatment with nitric acid and dilute soda, leaves a residue of prismatic crystals composed entirely of $SiCr_3$. On increasing the amount of silicon, as well as these crystals, others, which are totally different, are formed. These are brilliant, with lozenge-shaped facets. This is the silicide $SiCr_2$. With still more silicon, large, very brilliant prisms of Si_2Cr_3 are formed. Finally, with an excess of silicon, a crop of small dark-coloured crystals results, much less brilliant than the preceding; these are Si_2Cr.

The new silicide Si_2Cr_3 has the sp. gr. 5·6; it scratches glass but not quartz. Chlorine unites with it at 400°C. with incandescence, forming chromic chloride and silicon chloride; bromine has a less active affinity at a red heat; iodine is without action. It is permanent in the air; when heated to 1100°C. it becomes covered with a thin iridescent coating of oxide, which prevents further oxidation. Gaseous HCl decomposes it, producing chromous chloride; aqueous HCl has no action in the cold, but the strong acid dissolves it very rapidly on warming. HNO_3 and H_2SO_4 are

without action. $KClO_3$ and KNO_3 in fusion, which react energetically on chromium carbide, are without action on the silicide, but with KCO_3 it is rapidly converted into a silicate and chromium oxide.

Cineol, New Reaction for. E. Kremers. (*Pharm. Review*, **21**, 170.) Cineol forms with iodol a greyish-green crystalline compound which is quite distinctive. The iodol is added to a solution of cineol in petroleum ether and shaken to promote solution. On standing, crystals of cineol-iodol separate out.

Cinnamon Leaves, Essential Oil of. (*Schimmel's Report*, *Oct.*, **1902**, 27.) After removing the eugenol by shaking out with NaOH solution, the non-phenolic portion of the oil was found to contain linalol, and, in the higher fractions, safrol. No cinnamic aldehyde was found in the oil.

Cinnamon Oil, Synthetic. (*Chem. Zeit.*, **27**, 1045.) Schimmel and Co. have patented a method for producing an oil closely resembling that of true cinnamon, which involves the use, in addition to cinnamic aldehyde, eugenol and phellandrene, of normal amyl-methyl ketone, nonylaldehyde, cuminaldehyde, caryophyllene, linalol and its butyric ester, cymol, benzaldehyde, phenyl-propyl aldehyde, furfural, pinene, and eugenol methyl ester. All these have been recognized as constituents of true cinnamon oil, and the first six are of most importance in reproducing an odour resembling that of the natural product.

Citric Acid, Relative Proportion of in Lime and Lemon Juice. E. M. Holmes. (*Pharm. Journ.* [4], **16**, 705.) Some analyses made by the Government Analytical and Agricultural Chemist at Antigua on varieties of the lime, to test the acidity of the juice of the ripe fruits, have proved that the juice of the ordinary lime contains 36·15 grains of citric acid per ounce, and that of the spineless variety 37·73 grains, as against 30·32 from the Sicily or Villa Franca lemon, showing that the spineless variety is the best for citric acid manufacture or for lime juice. The fruits were grown at the Botanic Station, Dominica. Citrate of lime recently sent from this island was sold in London at the current rate. It showed 68·9 per cent. of citric acid, and realized £2 4*s*. per cwt. F. Watts (*West Ind. Bull.*, iii., 152) is of opinion that when the citrate is made of uniform and dependable quality, it will replace the concentrated lime juice at present exported, and when once the cost of apparatus is defrayed, it will pay better to manufacture the citrate.

Citron or Cedrat Oil. London Essence Company. (*Chem.*

and Drugg., **61**, 132.) Commenting on the previously published figures of Gulli and of Burgess (*Year-Book*, **1902**, 58), and to further elucidate the cause of the discrepancies, cedrat oils from various sources have been obtained and compared, with the following results:—

No.	Particulars of Oils	Physical Constants of Oils		Distillation: Quantities in c.c.	Distillation: Rotations	Distillation: Zeiss Readings	Distillation: Refractive Indices	Distillation: Aldehydic Content of Third Fraction
					° ′			Per Cent.
1	Citron (cedrat) oil, pure.	Specific gravity	= 0·8518	10	+ 86 20	71·5	1·4782	
		Rotation	= +80° 18′	80	+ 87 21	72·5	1·4788	52
		Refractive index	= 1·4750	7	+ 15 7	85·0	1·4812	
2	Citron oil, probably adulterated with lemon oil.	Specific gravity	= 0·8568	10	+ 67 57	71·9	1·4784	
		Rotation	= +70° 18′	80	+ 77 39	72·5	1·4788	49
		Refractive index	= 1·4755	7	+ 7 57	86·0	1·4817	
3	Schimmel's citron oil.	Specific gravity	= 0·859	10	+ 47 22	71·9	1·4784	
		Rotation	= +56° 10′	80	+ 64 2	72·1	1·4786	32
		Refractive index	= 1·4745	6·5	− 4 8	73·9	1·4747	
4	Lemon oil of high rotation.	Specific gravity	= 0·857	10	+ 63 31	71·7	1·4738	
		Rotation	= +67° 28′	80	+ 75 15	72·4	1·4787	42
		Refractive index	= 1·4758	7·5	+ 10 5	84·1	1·4806	
5	Lemon oil, normal.	Specific gravity	= 0·857	10	+ 55 30	72·0	1·4735	
		Rotation	= +63° 12′	80	+ 70 40	72·4	1·4787	42
		Refractive index	= 1·4755	7·5	+ 10 56	82·5	1·4797	
6	Sweet orange oil.	Specific gravity	= 0·850	10	+ 98 18	70·5	1·4726	
		Rotation	= +95° 30′	80	+100 50	71·2	1·4730	4
		Refractive index	= 1·4735	8	+ 88 1	70·3	1·4725	
7	Lime oil, hand pressed.	Specific gravity	= 0·883	10	+ 34 5	73·3	1·4744	
		Rotation	= +39° 6′	66·5	+ 53 50	73·6	1·4745	52
		Refractive index	= 1·4846	15	− 5 15	93·8	1·4861	

Citron Oil, Pure and Sweet Lemon Oil, Characters of. S. Gulli. (*Chem. and Drugg.*, **62**, 22.) The author has personally directed the preparation of pure hand-pressed "cedrini" oil to ensure the authenticity of the sample. 1,000 citrons yielded 450 Gm. of oil, of a yellow colour and fine odour and flavour. When first prepared it contains a large amount of white crystalline suspended matter, giving the oil a turbid and silky appearance. It had the sp. gr. 0·851 and the $[\alpha]_D + 80° 50'$.

Sweet lemon oil, which, from its fine aroma, might be used as a substitute for citron oil, had the following characters: Sp. gr. 0·856, $[\alpha]_D + 64° 34'$. By mixing sweet lemon, true citron, and sweet orange oil, products may be obtained having the sp. gr. and rotation of true "cedrini" citron oil, but devoid of its characteristic silky appearance. (Compare *Year-Book*, **1902**, 58.)

Citronella Oil, Adulterated, and Standards for the Pure Oil. E. J. Parry and C. T. Bennett. (*Chem. and Drugg.*, **62**, 88, 408 and 999.) The authors find that purified resin spirit is used as an adulterant of citronella oil, and further that certain oils containing this adulterant may pass Schimmel's test of solubility in "1 or 2 volumes of alcohol 80 per cent., remaining clear, or not showing more than a slight turbidity when the addition of alcohol is increased from 5 or 10 volumes, and separating no oily drops on standing."

The following figures were obtained from 8 samples of the oil in question:—

—	Sp. Gr. at 15°C.	Rotation in 100 mm.	Esters as Geraniol Acetate.	Total Acetylizable Constituents as Geraniol.
			Per Cent.	
1	0·892	−11°	13·0	53·3
2	0·897	−12°	15·4	57·6
3	0·891	−11°	15·3	57·5
4	0·891	−10°	17·3	53·6
5	0·892	−10°	14·7	51·5
6	0·893	−10°	16·3	55·4
7	0·893	−11°	14·2	52·6
8	0·891	−10°	15·0	56·8

The oils formed a practically clear mixture with an equal volume of 80 per cent. alcohol, but on further addition of the

alcohol oily drops separated, and from 5 to 6 per cent. of an insoluble oily liquid rose to the surface after standing for about 12 hours. An examination of the insoluble portion thus separated showed at once that it had no characters in common with kerosene, the once usual adulterant of citronella oil. It had the following characters :—

Sp. Gr. at 15°C.	0·860
Optical rotation in tube of 100 mm.	—15°
Esters	10·2 per cent.
Total geraniol	20·5 per cent.

It was not very soluble in 90 per cent. alcohol, but was miscible with absolute alcohol in all proportions.

Comparative fractionations of pure citronella oil and of the abnormal oil were made at low pressure (about 20 mm.). In the first series, fractions were collected at definite temperatures, and the following results obtained :—

Fractions.	Portion Collected.	Sp. Gr.	Rotation.	A Pure Sample of Similar Characters but answering Schimmel's Test.		
	Per cent.			Per cent.		
I. below 80°C.	8·0	0·838	−85°	8·0	—	−44°
II. 80– 85°C.	8·0	0·855	−81°	9·0	0·858	−44°
III. 85– 95°C.	9·5	0·888	−22°	6·0	0·868	−21°
IV. 95–110°C.	12·0	0·892	−10°	10·5	0·888	−11°
V. 110–125°C.	14·5	0·902	− 7°	10·5	0·902	− 8°
VI. 125–130°C.	15.0	0·904	− 7°	15·0	0·904	− 8°
VII. 130–140°C.	—	—	—	23·0	0·906	− 7°
VIII. 130–140°C.	—	—	—	8·0	0·922	− 5°

The first three fractions were insoluble in 80 per cent. alcohol, the others being soluble.

A typical commercial sample of resin oil had the following characters :—

Sp. gr.	0·8345
Optical rotation	+8°

Fractionation under reduced pressure—

I. (8%). Sp. gr. 0·806 Rot. +4° Ref. index 1·4408 at 20°.
II. (12%). Sp. gr. 0·818 Rot. +5° Ref. index 1·4465 at 20°.

Fractionation under atmospheric pressure—

Below 160°C.	8 per cent.
170°C.	21 per cent.
180°C.	40 per cent.
190°C.	54 per cent.
200°C.	65 per cent.
210°C.	76 per cent.
220°C.	85 per cent.

The optical rotation of the first two fractions of this oil are, it will be seen, distinctly dextro-rotatory. The refractive index agrees closely with the first fractions of an adulterated citronella oil, and the reduction in the normal rotation of the first 10–15 per cent. of citronella oil is approximately what would be indicated by admixture with these slightly dextro-rotatory substances.

It has been found that a mixture consisting of 15 parts of this oil with 85 parts of pure citronella oil has physicial characters very similar to the abnormal citronella oils examined. On treatment with 80 per cent. alcohol, from 5 to 6 per cent. remains insoluble, and the conclusion is that the oils which have appeared in such large quantities on the London, Liverpool, and American markets are adulterated to the extent of 12½ per cent. and upwards with resin spirit.

The behaviour towards "Schimmel's test" of pure citronella oil mixed with known volumes of resin spirit is found to vary.

Some oils when mixed with 5 per cent. of resin spirit will not dissolve to a clear solution in 10 volumes of 80 per cent. alcohol, whilst occasional samples have been met with to which as much as 20 per cent. may be added without interfering with Schimmel's test. Although it is clear that all pure oils should pass this test, which has for years served as a standard of purity for citronella oil, the fact that some impure oils are now clearly shown to also pass the test renders it imperative that a fresh standard should be adopted for pure oils.

It has been found that an examination of the first 10 per cent. distilled from the oil under a reduced pressure of 20 to 40 mm. will give sufficient information to ensure the purity of the sample, and this examination, together with the solubility of the original oil in 10 volumes of 80 per cent. alcohol, are together sufficient to detect all probable adulterations. The physical characters of the first 10 per cent., distilled under reduced pressure, which should be determined are: solubility in 80 per cent. alcohol; specific gravity; rotation; refractive index.

Suggested Standard. It is necessary to bear in mind that citronella oil may often be sophisticated to satisfy a given test, so that the other characters of the oil must always be taken into account. Not only are the sp. gr. and the optical rotation of importance, but the actual content of geraniol and citronellal must be regarded as deciding the actual value of the oil. Umney has strongly advocated the determination of the acetylizable constituents, and—given oils of one class—the value must be regarded as proportional to this figure. Few oils contain less than 60 per cent., and 55 per cent. is certainly the lowest figure which could be accepted. If the oil were sold on a valuation of its geraniol and citronellal content it would be on a scientific basis, and oils would be graded as they are in the case of cassia oil. The following figures will ensure a pure oil (being based on normal distillates) and entirely prevent the pernicious adulteration now so commonly obtaining:—

*Sp. gr. at 15·5°C.	0·900 to 0·915.
*Optical rotation (100 mm.)	0° to −15°.
Sp. gr. of first 10 per cent. (distilled at 20–40 mm.)	Above 0·858.
Refractive index of ditto	Above 1·4570.
Solubility in 80 per cent. alcohol	To pass Schimmel's test
Geraniol and citronellal (calculated as total geraniol)	Above 58 per cent.

The limits marked by asterisks apply to most normal Ceylon oils. To many—indeed, to most—East Indian distillates they do not apply.

Adulterated citronella oils on the market were found to give fractions when distilled at 20–40 mm. pressure, having the follow- characters:—

—	Sp. Gr. at 15·5°	Rotation in 100 mm. Tube	Refractive Index at 19°C.
1	0·822	−26° 48′	1·4492
2	0·824	−23° 50′	1·4504
3	0·833	−18° 20′	1·4525
4	0·820	−22°	1·4486
5	0·844	−17° 30′	1·4540
6	0·836	−29°	1·4495

Citronella Oil, Jamaican. (*Schimmel's Report, April,* **1903**, 23.) A specimen of citronella oil from the Government Laboratory in Jamaica was found to have characters intermediate between

Ceylon and Java citronella. The sp. gr. was 0·8947; $[\alpha]_D = -4° 16'$ and the refractive index 1·47098. The total alcohols as $C_{10}H_{18}O$ equalled 86·4 per cent.; citronellal was present to the extent of 25·43 per cent.

Civet. A. Hébert. (*Bull. Soc. Chim.* [3], **27**, 997.) Samples of civet of known origin have been examined and compared. The "pure" samples melted at 36–37°C., but the melting was not sharp. Pure civet is soluble in ether, benzol, chloroform, petroleum ether, in the cold and more readily on warming. It is insoluble in water, in acids and in alkalies. In general characters it resembles a fat. The matter insoluble in these solvents consists of accidental impurities and varied in amount in the specimens examined by the author from 3·6–5·3 per cent. The ash ranged from 0·8–1·20 per cent. Civet, in ether-alcohol solution, is practically devoid of optical activity. On submitting it to steam distillation the greater part of the fæcal odour is distilled off, and the fatty residue has a musk-like odour. The distillate has a most unpleasant odour, and appears to contain no insoluble matter, but holds skatol in solution. Various samples were observed to differ in their behaviour under steam distillation, some being deprived of their offensive odour less readily than others.

The amount of fatty acids, obtained by saponification with alcoholic potash and subsequent regeneration with acid, varies very widely; one specimen gave 55 per cent., another 70 per cent. The author attributes the difference observed in commercial civet partly to specific variations in the secretion of different animals and partly to its method of extraction, since the instrument employed for that purpose is generally lubricated with oil or honey in order to facilitate its introduction into the secreting sac. (Compare *Year-Book*, **1897**, 195.)

Civet, Commercial. E. J. Parry. (*Chem. and Drugg.*, **61**, 901; **62**, 871.) During the last twelve months a very large number of samples of civet have been examined. Of these by far the majority were adulterated. The usual adulterant is petroleum jelly, which can be detected and quantitatively determined with considerable accuracy; but very frequently organic matter of vegetable origin is present in civet.

The most trustworthy process for detecting petroleum jelly is that devised by Dodge. It consists in extracting the civet with acetone until nothing further is removed, and then extracting with

petroleum ether, which takes out the petroleum. The residue after the acetone extraction is a greyish powdery mass, which may contain appreciable quantities of petroleum jelly without appearing sticky. Concordant results to within 0·2 or 0·3 per cent. are easily obtained. Numerous samples of pure civet have been examined, and only a very slight amount is extracted from them by petroleum ether in these circumstances. When petroleum jelly is present, the petroleum ether extract is highly fluorescent, which is not the case with pure civet.

A microscopical examination of the pulverulent residue will afford considerable information as to the presence of other adulterants, and a comparison with the residues from pure civet and from banana pulp is sometimes of much interest.

Hébert (*supra*) states that pure civet leaves only from 3–5 per cent. of residue when treated with organic solvents other than alcohol and acetone. These figures are in agreement with those published some years ago by Braithwaite, and with the author's own examination of reliable samples. Pure civet, however, appears to be the exception rather than the rule, and although no general scheme of analysis is possible, on account of the varied adulterants used, it is found that the following process will reveal the chief adulterants now being used. The civet (5 Gm.) is mixed with a little kieselguhr or other suitable diluent and extracted thoroughly with acetone. When no more can be extracted, the residue is exhausted with petroleum ether, which will extract any petroleum jelly present. If the residue be now dried and weighed, it will be found in many cases to be considerably above the amount of kieselguhr used and the normal 5 per cent. undissolved by the organic solvents.

From 22 out of 38 samples, between 18 and 26 per cent. of undissolved residue was obtained. On boiling with water, a large proportion of this is dissolved. The aqueous solution does not reduce Fehling's solution, but on inversion with hydrochloric acid a copious reduction takes place. If the solution be evaporated, the residue is of a gummy nature, so that the adulterant, whatever it may be, is apparently of a carbohydrate nature. Some samples develop a distinct coconut odour on keeping. One sample was hydrolyzed with alcoholic potash, and from the products of saponification the characteristic fatty acids of coconut oil were obtained, but in the present state of our ignorance as to the characters of normal civet fat no definite deductions can be made.

Civet, Pure and Commercial. H. E. Burgess. (*Analyst*, **28**, 101.) Five different specimens of the secretion have been examined. Nos. 1 and 2 were deposits from cages of the animals at the Zoological Gardens. No. 3 was supplied commercially as "absolutely pure civet"; No. 4 was a commercial sample, and No. 5 was extracted by the author.

The following are the chief characteristics of these samples:

	Loss at 100°C. H_2O, etc.	Ash	Acetone Extract	Saponification Number of Acetone Extract	Residue of Acetone Extract	Chloroform Extract	Saponification Number of $CHCl_3$ Extract	Residue of $CHCl_3$ Extract
No. 1	6·3	2.7	—	—	—	75·8	43·1	—
No. 2	4·5	3·0	69·6	61	27·2	75·4	45·0	—
No. 3	27·0	3·5	43·6	114	28·9	47·2	113·0	23
No. 4	12·0	1·1	79·6	112	4·7	83·0	114·0	33
No. 5	15·9	3·3	60·0	33	21·0	—	—	—

The value of Dodge's method (*supra*) for the detection of vaseline is confirmed. In addition to this, butter, lard, soft soap and various fats have been recorded as adulterants. With Kjeldahl's method civet yields about 1·3 per cent. of nitrogen. The presence of skatol, as indicated by Hébert, has not been confirmed.

Clove Oil, Determination of Eugenol in. (*Schimmel's Report, April*, **1903**, 27.) Comparison of results obtained by the methods of Thoms (*Year-Book*, **1902**, 179), Umney's method modified, employing 5 per cent. NaOH solution (*Year-Book*, **1895**, 167), and Verley and Boelsing's process (*Year-Book*, **1902**, 59) show that Umney's modified method is not only more convenient, but is generally more accurate. Verley and Boelsing's process is found to be far from reliable, and the inaccuracy of Thoms' method has been demonstrated previously. The method recommended by Schimmels consists simply in shaking a known weight or volume of clove oil with an excess of 5 per cent. NaOH solution in a graduated burette or Hirschsohn flask, and reading off the volume of the undissolved non-eugenol portion which floats on the surface.

Clove Oil, Determination of Eugenol in. E. C. Spurge. (*Pharm. Journ.* [4], **16**, 701, 757.) As the result of critical experiments, which are fully detailed, the author concludes that neither the methods of Thoms, Umney, nor of Verley and Boelsing give absolutely accurate results.

Clove oil contains considerable quantities of eugenol as ester—from 7 to 17 per cent., calculated as eugenyl acetate.

The eugenol as ester ought to be taken into account in determining the percentage of eugenol.

The method of Thoms only partially determines the eugenol as ester. The correction for the solubility of benzoyl-eugenol, moreover, is far from accurate. The method is capable of improvement, but, on account of its tediousness, it is better to employ other processes.

Umney's method determines the free and combined eugenol. The high results obtained by it are chiefly due to the presence of esters. It is quick and convenient, and the results, even when uncorrected, are more accurate than those obtained by Thoms' method. By saponifying the oil and correcting, results within 2 per cent. can be obtained.

The free eugenol can be determined within 1 per cent. by Verley and Boelsing's method, which is both quick and simple.

To evaluate a clove oil, either Verley and Boelsing's process, plus the eugenol by saponification, or Umney's modified method, minus the correction obtained from saponification figures, should be used, together with a determination of the specific gravity. Verley and Boelsing's method, plus the eugenol by saponification, is doubtless the more accurate, but for a pharmacopœial test, Umney's method, uncorrected, together with the specific gravity, would perhaps be accurate enough, while it is certainly the simplest.

Clove Oil, Methyl Heptyl Ketone in. (*Schimmel's Report, April,* **1903,** 26.) Accompanying methyl benzoate (*Year-Book,* **1902,** 59), in the first runnings of clove oil distillation, methyl heptyl ketone also occurs. This body has hitherto only been found in rue oil (*Year-Book,* **1901,** 108; **1902,** 134). It was isolated from the saponification liquor, after decomposing the ester by means of alkali.

Cobalt, New Reaction for. J. L. Danziger. (*Journ. Amer. Chem. Soc.,* **24.**) Five c.c. of the solution to be tested is acidified with HCl; a few fragments of ammonium thio-acetate are added, followed by a few drops of $SnCl_2$ solution, and an equal volume of amylic alcohol. The mixture is shaken and set aside. In the presence of cobalt the upper layer which separates is coloured an intense blue, due to the formation of the salt $(CH_3COS)_2Co.2CH_3COSNH_4$. The reaction is sufficiently delicate to detect a dilution of 1 : 500,000 of cobalt. Stannous chloride is added to reduce any

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ferric iron which may be present to the ferrous state, thus obviating the production of a deep red colour with the reagent.

Cobalt Nitrate as a Reagent. W. Carter White. (*Pharm. Journn.* [4], **15**, 68.) Although cobalt nitrate gives many typical reactions, text-books do not state to what advantage it may be used in qualitative analysis.

The strength of the cobalt nitrate solution recommended is 1 in 30, and the salts to be tested should be boiled and neutralized.

With phosphates this solution gives a violet precipitate soluble in ammonium hydrate and dilute acids.

Arsenates and arsenites give a pink precipitate, also soluble in ammonium hydrate and dilute acids.

Cobalt nitrate does not give a precipitate with pure hypophosphites, but with a hypophosphite containing one part of phosphate in two hundred a light blue precipitate, best seen after standing one or two minutes, is obtained.

This reaction is very sensitive, and is one of the best for indicating the presence of phosphates in hypophosphites.

Added to a ferrocyanide, cobalt nitrate gives a green precipitate, insoluble in ammonium hydrate and dilute acids, and with ferricyanides it yields a red precipitate, also insoluble in ammonium hydrate and dilute acids.

Coca Leaves, Javan, New Constituents of. O. Hesse. (*Journ. für Prakt. Chem.* [2], **66**, 401, through *Journ. Pharm. Chim.* [6], **17**, 489.) Four new yellow substances have been isolated from the leaves of *Erythroxylum spruceanum*, after removing the bases. These are *cocacitrin*, *cocaflavin*, *cocaflavetin* and *cocacetin*. All are soluble in alcohol, are acid in reaction, and give a green colour with Fe_2Cl_6 and a yellow colour with alkalies.

Powdered coca leaves are first extracted with petroleum ether, to remove wax and green colouring matter; then with alcohol. After distilling off the latter solvent and treating the residue with acid to remove the alkaloids, the part left insoluble is taken up with ether, which removes all the new compounds except cocacitrin, which is practically insoluble in that menstruum.

Cocacitrin, $C_{28}H_{32}O_{17} + 3H_2O$, is obtained by treating the ether-insoluble residue with boiling Ba2HO solution, from which it is precipitated on acidifying. It crystallizes from alcohol in very fine, bright yellow, prismatic needles, which become anhydrous at 175°C., and melt at 186°C. It is fairly soluble in boiling water. With acetic anhydride it gives heptacetyl cocacitrin, $C_{28}H_{25}$

$(CO.CH_3)_7O_{17}$. Dilute acids hydrolize it quantitatively on boiling, forming a sugar, *cocaose*, $C_6H_{12}O_6$, and *cocacetin*, $C_{16}H_{12}O_7$; thus

$$C_{28}H_{32}O_{17} + 2H_2O = 2C_6H_{12}O_6 + C_{16}H_{12}O_7.$$

Cocaose crystallizes, after a time, in octahedra with 1 mol. H_2O. It melts at 89–90°C., and is dextro-rotatory, $[\alpha]_D = +18° \ 8'$; its osazone occurs in small needles, melting at 179–180°C.

Cocacetin, $C_{16}H_{12}O_7 + 3H_2O$, may be isolated from the ethereal extract of the leaves, but is more conveniently obtained, as shown above, by the hydrolysis of cocacetrin. It crystallizes from alcohol in small yellow needles, which become anhydrous at 130°C., and melt at 260–265°C. When acetylized, it forms a tetracetyl; when fused with alkali, another yellow body, *decocacetin*, $C_{15}H_{14}O_6$, is first formed, then phloroglucin, and lastly protocatechuic acid.

Cocaflavin, $C_{34}H_{38}O_{19} + 4H_2O$, crystallizes from alcohol in yellow prismatic needles which become anhydrous at 120–130°C., and then melt at 163–164°C. Dilute acids hydrolize it into cocaflavetin, glucose and galactose; thus $C_{34}H_{38}O_{19} + 2H_2O = C_6H_{12}O_6 + C_6H_{12}O_6 + C_{22}H_{18}O_9$.

Cocaflavetin, $C_{22}H_{18}O_9 + 3H_2O$, is obtained by precipitating its solution in boiling acetic acid with water. It is thus thrown out as pale yellow needles, melting at 230°C. When heated with HI it is converted into nor-cocaflavetin, $C_{20}H_{14}O_9$; it therefore contains two methoxyl groups.

The quercitrin reported by Eykmann as occurring in Javan coca leaves is identical with cocacitrin; and Warden's coca-tannic acid is a mixture of cocacitrin and cocaflavin.

Coconut Milk, Constituents of. G. Denigès. (*Journ. Pharm. Chim.* [7], **17**, 245, after *Bull. Soc. Pharm. de Bordeaux.*) The "milk" of the coconut is rich in a very active peroxydase. A few drops of the liquid added to a few c.c. of aqueous guaiacol solution and a drop of H_2O_2, give, even at ordinary temperatures, but more rapidly at 40°C., a reddish yellow colour, then crimson, due to the formation of a guaiacolic quinhydrone. This peroxydase becomes inactive if heated to 78–79°C. The sugar contained in the milk, which may amount to as much as 8 per cent., differs with the degree of ripeness of the nut. It is a mixture of glucose and fructose.

Choline is present in coconut milk in considerable quantity; on adding a drop of Florence's reagent (solution of iodine, 6; KI, 8; in H_2O, 150) to a few drops of the milk, abundant characteristic crystals of iodo-choline will be obtained.

Coffee Oil. Ernst Erdmann. (*Berichte*, **35**, 1846, through *Chem. Centr.*, **73**, 64.) 225 kilos. of roasted coffee, distilled with live steam, gave, when the aqueous distillate was shaken out with ether, and the solvent evaporated, 83·5 Gm. of a brown oil with an intense odour of coffee, having the sp. gr. 1·0844 at 16°C., and containing 3·1 per cent. of nitrogen. By simple distillation with water 50 kilos. of the same coffee gave only 11·1 Gm. of oil. The oil was found to contain acetic, valerianic, and methyl-ethyl-acetic acids. On fractionating furfur-alcohol, $C_4H_3O{\cdot}CH_2{\cdot}OH$, and furfural, $C_4H_3O{\cdot}CHO$, were found in the first fraction. The second and third fractions consisted of a light brown oil, which gave a sublimate of crystalline needles. The third fraction contained the bulk of the characteristic odourous body. When freed from phenols by treatment with alkali, this was found to contain 9·71 per cent. of nitrogen, and yielded a small quantity of a bright oil boiling in at 93°C., soluble in a large volume of cold water, imparting to the solution the odour and flavour of coffee. The nitrogen-containing base is very sensitive to the action of acids. By the action of gaseous HCl it forms a volatile base with a pyridine-like odour. From the alkaline washings of this fraction, phenols were liberated by CO_2 as a yellow oily liquid with an odour similar to guaiacol. The fourth fraction consists mainly of phenols with a creosote odour. It is to the presence of these phenols that the recorded antiseptic action of coffee is due. It is noteworthy that by heating together a mixture of caffeotannic acid, cane sugar, and caffeine, a marked coffee aroma is obtained. Sugar and caffeine alone do not give this odour. Sugar and caffeotannic acid under like conditions give a pungent coffee-like odour, but the delicate aroma of coffee is only obtained with the addition of caffeine to the other two ingredients.

Cohune Nuts from British Honduras. (*Bull. Imp. Inst.*, **1**, 25.) These nuts, produced by the Cohune palm *Attalea cohune*, yield, when extracted by ether, rather more than 40 per cent. of oil, which has the following characters: Melting point, 18–20°C.; solidifying point, 15–16°C.; saponification equivalent, 253·9–255·3; iodine absorption, 12·9–13·6; the fatty acids from the oil melted between 27 and 30°C.

It thus appears that Cohune nut oil closely resembles coco and palm nut oils, and could, no doubt, be utilized for the same purposes as these oils. Cohune oil was found to saponify readily, forming a soap which was almost entirely free from smell. This

material would therefore probably be of value for the manufacture of the finer soaps.

Collargol, Nature of. M. Hanriot. (*Comptes rend.*, **136**, 680.) It is considered that collargol, and probably the other forms of colloidal silver, are not allotropic forms of that metal, but salts of a peculiar acid—collargotic acid. When solutions of collargol are submitted to electrolysis the black deposit which forms on the positive pole is this acid, which dissolves in alkalies and alkaline carbonates, forming a solution with a characteristic red colour. If solutions of collargol be treated with just sufficient $AgNO_3$ so as to cause complete precipitation, at this point no silver, either as nitrate or as collargol, will be left in solution; in fact, collargol behaves as a neutral salt. The precipitate from this treatment, too, is not pure metallic silver, but contains collargotic acid, which gives, with ammonia, a red solution. When collargol is precipitated with copper or barium salts, traces of those metals are invariably found in the precipitates. It is further pointed out that colloidal silver has never been obtained pure. Carey Lea has obtained it once containing 98·1 per cent. Ag, but this was converted into ordinary silver on attempts at further purification. The author considers collargol to be the ammonium salt of collargotic acid.

Cotton-seed Oil, Limitations of Halphen's Test for. Elton Fulmers. (*Journ. Amer. Chem. Soc.*, **24**, 1148.) The author points out that cotton-seed oil, after being heated to 260–270°C., fails entirely to respond to Halphen's test (*Year-Book*, **1898**, 103.) The intensity of the reaction is very greatly lessened by heating to 220–240°C. Since cotton-seed oil may possibly be heated to 280°C. without rendering it unsuitable for use as an article of food, and since heating to the lower temperature is certainly without any deleterious action on the oil, it follows that this treatment would render cotton-seed oil more available for the adulteration of other oils where Halphen's reaction is relied on for its detection. Further, in the case of *lard*, the authors find that the lard of hogs fed on cotton-seed cake gives a marked reaction with Halphen's test, equivalent in tint to that obtained with an admixture of several percentages of cotton-seed oil. An admixture of 25 per cent. of cotton-seed oil which has previously been heated to 220–240°C., or a much larger quantity if heated to 250–260°C., may be mixed with other fats and will not give a more intense reaction than that obtained from the lard of hogs fed on cotton-seed cake.

Creosote, Rapid Determination of Phenol in by Means of Glycerin and Water. R. Michonneau. (*Journ. Pharm. Chim.* [7], **17**, 161.) The presence, and approximately, the amount of phenol in creosote may be determined by means of the solubility of the former in a mixture of glycerin and water as follows:—

Fifteen c.c. of creosote are mixed in a 50 c.c. graduated cylinder with 5 c.c. of glycerin. The solution is then made up to 50 c.c. with water, well shaken and allowed to separate. The volume of the separated creosote is then read and the supernatant liquid decanted. Water is again added up to 50 c.c., agitation, separation and reading are repeated. Decantation is again performed, a third washing with water made, and the third reading of separated creosote taken.

Pure creosote thus treated gave 14·3 c.c. of insoluble residue with the second and third washing. Creosote containing 10 per cent. of phenol showed 14·3 c.c. after the second washing, and 13·5 c.c. after the third. A mixture of creosote containing 20 per cent. of phenol showed 13·3 c.c. of creosote at the third washing, and one containing 40 per cent. of phenol only 12 c.c. under like conditions.

The method is useful in giving rapidly, but approximately, the amount of phenol present in creosote.

Cryptomeria japonica, Essential Oil of. C. Kimoto. (*Schimmel's Report, Oct.*, **1902**, 32.) The oil reported on is obtained by the steam distillation of chips of the wood of *Cryptomeria japonica*, a conifer indigenous to Japan. The wood and oil have a pleasant odour, somewhat resembling peppermint. It contains a neutral body, $C_{30}H_{48}O$, b.p. 264°, and sp. gr. 0·935, which has been named "sugiol" from the vernacular name of the tree.

Cyanogenetic Glucosides in Immature Fodder Plants. (*Bullet. Imp. Inst.*, **1**, 12.) The discovery by Dunstan and Henry of the presence of cyanogenic glucosides, which, under the influence of specific ferments, liberate prussic acid, and therefore render the plants containing them poisonous to cattle, has led to further investigation on the subject. In some instances, as in the case of *Sorghum vulgare*, it appears that the glucoside is only present in the immature plant. When ripe, this is harmless and affords excellent fodder for herbivorous animals. A toxic glucoside of this nature, *lotusin*, has been isolated from *Lotus arabicus*, which, under the influence of the enzyme *lotase*, liberates prussic acid, glucose, and a yellow colouring matter, lotoflavin. When fully

matured, and when the seeds have formed, the glucoside disappears and the plant becomes harmless. *Lotus australis* is found, in the immature state, to contain an analogous glucoside, the precise identity of which with lotusin has not yet been determined.

Sorghum vulgare contains the glucoside *dhurrin*, and, when hydrolized by the natural enzyme of the plant, which appears to be identical with emulsin, gives prussic acid, para-hydroxy-benzaldehyde and glucose. When the plants are 18 to 24 inches high they yield 0·25 per cent. of HCN; as growth proceeds the amount diminishes, until when the plant reaches maturity, it completely disappears.

Cassava from *Manihot utillissima* also contains a cyanogenetic glucoside, which, in its decomposition, furnishes the HCN which has hitherto been considered to exist in a free state in the tuber.

Phaseolus lunatus from Mauritius and Rangoon beans, or Paigya beans from Rangoon, also contain a glucoside which gives HCN. On the other hand, the seeds of *Leucœna glauca* and of *Pachyrizus tuberosus* were not found to yield prussic acid, although they are very poisonous to cattle.

Dammar Resin, Essential Oil of. H. Haensel. (*Pharm. Post*, **35**, 715.) Dammar resin yields 1·06 per cent. of golden yellow, very bitter, essential oil which has the sp. gr. 0·9352 and is optically inactive. It is freely soluble in ether, benzol, chloroform, carbon disulphide, acetic ether or absolute alcohol; 80 per cent. is soluble in alcohol 90 per cent. It begins to distil at 205°C.; 60 per cent. passes over at about 240°C.; this fraction has the sp. gr. 0·9157; a further 30 per cent. distils at 265°C.; the residue resinifies.

Derris uliginosa, Chemistry of the Stem of. F. B. Power. (*Proc. Amer. Pharm. Assoc.*, **50**, 296.) The investigation had for its aim the isolation of the principle toxic to fish, the stem being used in the East as a fish poison. No evidence of an alkaloid was obtained. It contains about 6·6 per cent. of tannin, which gives a greenish coloration with Fe_2Cl_6. Besides gum and sugar, the stem contains considerable quantities of inorganic salts, notably potassium nitrate.

The original alcoholic extract of the drug, when extracted by petroleum ether (b.p. 40–60°C.), afforded a considerable amount of a very dark coloured oily liquid. This was hydrolyzed by heating with alcoholic potash. The portion of the hydrolyzed product

which had entered into combination with the alkali yielded a very small amount of caproic acid, $C_6H_{12}O_2$. A crystalline acid was also obtained, having a melting point of 74–75°C., and agreeing in composition with arachidic acid, $C_{20}H_{40}O_2$. The mother liquors from the latter contained an acid which was identified by the analysis of its crystalline amide, m.p. 95–96°C., as stearic acid $C_{18}H_{36}O_2$.

The portion of the hydrolyzed product which had not entered into combination with the alkali was found to contain a small amount of ceryl alcohol, $C_{27}H_{56}O$, m.p. 80–81°C., and a considerable quantity of two isomers of cholesterol, $C_{26}H_{44}O$. One of these, which occurred in relatively small amount and was sparingly soluble in 90 per cent. alcohol, had a melting point of 207–209°C., while the one constituting the larger portion was more freely soluble in alcohol, and melted at 190–192°C. The optical rotation of the latter, in chloroform solution, was $[\alpha]_D = +25{\cdot}5°$. When dissolved in a little acetic anhydride, and a few drops of concentrated sulphuric acid added, both of them gradually developed a rose-red coloration, changing to brown.

The original resin, which had been extracted as above mentioned by petroleum, was redissolved in alcohol, precipitated by water, and dried. It was then extracted with chloroform, and thus resolved into portions soluble and insoluble therein.

Resin soluble in chloroform. This was an amorphous substance, which contained no nitrogen, and was not glucoside. By the action of hydrochloric acid in alcoholic solution it afforded a small amount of a substance which crystallized in fine yellow needles, was very sparingly soluble in cold alcohol, and melted at 212–213°C. This would appear to be identical with the so-called "anhydroderrid" of Sillevoldt, but on analysis it gave somewhat different figures from those recorded by him.

On fusion with potash this resin afforded acetic and valerianic acids, and a very small amount of a substance giving a violet coloration with ferric chloride. By the oxidation of the resin with nitric acid a small amount of a crystalline acid was obtained, melting at 75–76°C., and agreeing in composition with behenic acid, $C_{22}H_{44}O_2$. It is probable, however, that the latter preexisted as such or in some form of combination in the resin Other products of the oxidation were oxalic acid, and a pale yellow, crystalline substance, which, when dried at 115°C., melted at 170–172°C. This was a nitro-product.

Resin insoluble in chloroform. This was obtained by the

precipitation of its alcoholic solution with water in the form of an amorphous, chocolate-brown powder, which contained no nitrogen. Its alcoholic solution was observed to froth considerably when shaken with water. When heated with 5 per cent. sulphuric acid, the filtered liquid was found to contain glucose, which was identified by means of its asazone. From the residual resin chloroform extracted a small amount of a substance, which, after purification by means of alcohol, crystallized in colourless, micaceous scales, melting at about 230°C. The amount of this substance was not sufficient for further examination. It was evident, however, from the small amount of sugar obtained by the hydrolysis, that only a portion of this resin consisted of a glucoside.

On fusion with potash this resin afforded acetic and protocatechuic acids. When oxidized in a cold alkaline solution with potassium permanganate, the only crystalline product that could be isolated was oxalic acid.

The poisonous action of Derris on fish may be observed when a cold aqueous infusion of the bark is mixed with a relatively large portion of water. The toxic effect, however, is evidently due to some constituent of that portion of the resin which is soluble in chloroform, and not to the tannin which the drug contains. This was demonstrated by the stupefying and finally fatal effect produced on a gold-fish when brought into a liquid containing so little of the active substance as was represented by one part of the resin in one million parts of water. The portion of resin insoluble in chloroform, when tested under precisely the same conditions, was quite devoid of activity.

Dicentra cucullaria, Alkaloids of. R. Fischer. (*Proc. Amer. Pharm. Assoc.*, **50**, 453.) *Dicentra cucullaria*, N.O. Fumariaceæ, contains, in addition to protopine, two other bases, named provisionally alkaloids "c" and "d." Alkaloid "c" is almost insoluble in alcohol. Purified by recrystallization from $CHCl_3$ it formed rosettes of fine needles, which melted at 231°C. with decomposition; exposed to sunlight it rapidly turned yellow. It gave a brick-red colour, changing to orange, then to yellowish brown, with strong H_2SO_4. With Erdmann's reagent the colour was first reddish, then orange, then brown, and finally violet. Froehde's reagent gave the same colour reactions. With strong HNO_3 the colour obtained was blood-red, soon turning yellow.

Only a minute quantity of alkaloid "d" was isolated. It was

fairly soluble in alcohol, from solution in which it was deposited in granular crystals melting at 215°C. The identity of these two bases with other known alkaloids has not yet been established.

Dithymol Dichloride. H. Cousin. (*Journ. Pharm. Chim.* [6], **16**, 378.) Continuing his investigations of the chloro-compound found as an impurity in commercial aristol (*Year-Book*, **1902**, 34), the author establishes its identity with dithymol dichloride, $C_{20}H_{24}Cl_2O_2$, that is, aristol in which the iodine atoms have been replaced by chlorine. This body is obtained by saturating a solution of thymol in caustic soda with chlorinated soda solution, when a brown precipitate is obtained, which is collected, washed, and dried. On dissolving this in ether, and pouring it into a large excess of alcohol containing a trace of SO_2, a bright yellow precipitate is formed, which is collected, washed, and dried. In appearance this compound is similar to aristol, and it agrees with it in general characters. It has no definite melting point.

In order to determine if this body, or a chlor-iodo-compound, $C_{20}H_{24}ClIO_2$, was the impurity found, an impure aristol was extracted several times with boiling absolute alcohol, when an insoluble residue was left which contained 4·4 per cent. of I, and 17·6 per cent. of Cl, which indicates the presence of the dichloro-compound, since the chlor-iodo-compound would give 27·69 per cent. of I, and 7·74 per cent. of Cl.

Dithymol dichloride differs from aristol in its behaviour with nascent hydrogen and other reducing agents, since it is not reduced, whereas aristol, under these conditions, liberates dithymol.

On treating dithymol in alkaline solution with excess of alkaline hypochlorite, dithymol dichloride is formed, as from thymol. An analagous bromo-compound, dithymol dibromide, $C_{20}H_{24}Br_2O_2$, has also been prepared, resembling the iodo- and chloro-compounds of thymol in general characters.

Dregea rubicunda, Active Principle of the Seeds of. W. Karsten. (*Berichte Pharm.*, **12**, 245.) A new glucoside has been isolated by the author from the seeds of *Dregea rubicunda*, collected in Ugogo by Busse. Thoms' method for the extraction of strophanthin was the process employed for its separation. The yield was 2·5 per cent. of a pale greenish yellow, neutral, hydroscopic, but not deliquescent, powder, which after exposure to the air, melts at 85°C., but when dried over H_2SO_4, at 107°C. It is readily soluble in water, alcohol, benzol, chloroform, and glacial

acetic acid, sparingly soluble in ether, insoluble in petroleum ether. Its empirical formula is $C_{19}H_{30}O_{10}$ or $C_{23}H_{38}O_{12}$. It does not reduce Fehling's solution until hydrolized by heating with a mineral acid. The taste is nauseous, burning and bitter. It gives with concentrated H_2SO_4 at first a brown, then a violet solution. The aqueous solution gives with a trace of Fe_2Cl_6 and H_2SO_4 a greyish green precipitate. With H_2SO_4 and $K_2Cr_2O_7$ it gives at first a blue colour, then dark green. It is hydrolized by 2 per cent. H_2SO_4 solution at 60°C. The glucoside is poisonous, but only has about one-fifth the toxic power of strophanthin; the symptoms produced by it on the animal organism are very similar to those of the latter glucoside. No alkaloid was found in the seeds, but the pericarps contained a slight trace of a base; on the other hand, they yielded no glucoside. Trigonellin was not detected in the seeds.

Dill Herb, Spanish, Essential Oil of. (*Schimmel's Report, April*, **1903**, 30.) Oil of dill herb, distilled in Spain, was found to have the following characters: Sp. gr., 0·9282; $[\alpha]_D = +45°47'$; refraction index 1·49638; insoluble in alcohol 80 per cent., but soluble about 1 : 5 in alcohol 90 per cent. It contained much phellandrene, only about 16 per cent. of carvone, and a little dill apiol. Dill oil, distilled from the fruits alone, has never been found to contain phellandrene; the presence in commerce of dill oil with that constituent is probably due, therefore, to portions of the herb being used for distillation, as well as the fruits.

Dressings, Sublimate, Rapid Determination of $HgCl_2$ in. G. Frerichs. (*Apoth. Zeit.*, **17**, 834, through *Journ. Pharm. Chim.* [6], **17**, 322.) 5 Gm. of the wool or gauze is packed fairly tight and moistened with small quantities of AmHS solution in such a manner as to slowly moisten it thoroughly. It is then washed freely, first with water, then with water acidified with a little HCl, and finally with pure water. The piece of material, which will now be black or grey, from the HgS formed, is squeezed out between the fingers, is introduced into a flask and treated with a known volume, 15–25 c.c. of N/10 iodine solution. After thoroughly moistening the material with thisby means of a glass rod, and having stoppered the flask, it is set aside for a while for reaction to be complete, 200 c.c. of water is added and the excess of iodine titrated back by means of N/10 thiosulphate solution in the usual manner. Since according to the equation $HgS + 2I = HgI_2 + S$, each atom of iodine is equivalent to half a molecular weight of

mercuric sulphide, therefore each c.c. of N/10 iodine solution used up will be equivalent to 0·01355 Gm. $HgCl_2$.

Elæococca vernicia, Fatty Acids of. L. Maquenne. (*Comptes rend.*, **135**, 696.) According to Cloez, the fluid oil extracted from the seeds of *Elæococca vernicia* by pressure or by extraction with ether, contains the glyceride of a fatty acid, named by him elæomargaric acid, which melts at 48°C. If, however, the extraction be performed with CS_2 a concrete oil is obtained, containing a glyceride of a fatty acid melting at 71°C., which is isomeric with the preceding. This he named elæostearic acid. Maquenne finds that this transformation is not due to CS_2, but to the minute trace of sulphur invariably present in that solvent. The liquid acid is at once converted into its solid isomer by contact with a little of the metalloid. Iodine acts in a similar manner. Maquenne has revised the formula of these acids, which he finds to be $C_{18}H_{30}O_2$, which is identical with that of the linolinic acid of linseed oil. He suggests that, as the nomenclature of Cloez is misleading, the acid melting at 48°C. should be named α-elæostearic acid, and that melting at 71°C. β-elæostearic acid.

Elemi, carana, from Protium carana. A. Tschirch and O. Saal. (*Archiv der Pharm.*, **241**, 149.) Continuing the systematic investigation of the elemis, the authors find the centesimal composition of Carana elemi, derived from *Protium carana*, indigenous to North Brazil, to be: Caramyrin, 20–25 per cent.; essential oil, 10 per cent.; isocareleminic acid, 2 per cent.; careleminic acid, 8 per cent.; carelemisic acid, 10 per cent.; careleresene, 30–35 per cent., with impurities, 12–15 per cent. A trace of bryoidin is also probably present. The resin acids were isolated by the authors' method of shaking out the ethereal solution with successive washings of various alkalies. Iso-careleminic acid, $C_{40}H_{56}O_4$, was thus removed with ammonium carbonate solution. It is amorphous and melts at 75°C. After its removal, shaking with 1 per cent. NaOH solution removed careleminic acid, $C_{40}H_{56}O_4$, and carelemisic acid, $C_{37}H_{56}O_4$. The former separate in well-formed needles, melting at 215°C. from solution in a mixture of methylic and ethylic alcohol, while the latter remains in solution. It is amorphous and melts at 120°C. The essential oil is obtained by steam distillation. It is a yellowish liquid with an aromatic odour recalling that of a mixture of dill, fennel and lemon oils. On fractionation it gives a colourless, fragrant distillate between 170° and 172°C.; a yellow-

ish, denser fraction between 172° and 200°C., and a brownish empyreumatic thick liquid above that temperature. The first fraction gives a cherry-red colour reaction with concentrated H_2SO_4. Caramyrin, $C_{30}H_{50}O$, is isolated from the residue of the steam distillation. After removing the acid resins by crystallization from ether alcohol, it melts at 175°C. It is identical with the amyrins obtained from other elemis. Like them, it is separable into α- and β-amyrin by means of the different solubility of the respective benzoic esters in alcohol 80 per cent.; α-amyrin benzoate is readily dissolved by that solvent, while β-amyrin benzoate is insoluble; α-amyrin melts at 181°C., β-amyrin at 192°C. Careleresene, $C_{27}H_{40}O_2$, melting at 75–77°C., is the indifferent resin left in the mother liquid after crystallizing out amyrin. (Compare *Year-Book*, **1902**, 72, 73.)

Elemi, Protium, Brazilian. A. Tschirch and J. Cremer. (*Archiv der Pharm.*, **240**, 321.) Brazilian Protium or Almessega elemi, derived from *Almessega branca*, contains protamyrin, 30 per cent.; protelemisic acid, 25 per cent. and proteleresene, 37·5 per cent. Only traces of essential oil and no bryoidin were present. Protelemisic acid is amorphous. The protamyrin has the same m.p., 170°C., and the same formula, $C_{30}H_{50}O$, as manamyrin and afamyrin.

Eschscholtzia californica, New Alkaloids in. R. Fischer. (*Proc. Amer. Pharm. Assoc.*, **50**, 451.) In addition to the alkaloids already isolated from *Eschscholtzia californica* (*Year-Book*, **1902**, 73), the author has obtained two other bases, designated provisionally "α" and "β," which have the following characters: Alkaloid "α" was obtained by fractional crystallization from chloroform-alcohol. It occurs in colourless rosettes, composed of thin prismatic crystals, which darken at 234°C. and melt at 242–243°C. The base dissolves without colour in concentrated H_2SO_4; it gives a reddish brown, then wine coloured, reaction with Froehde's reagent, and a dirty yellow with Erdmann's reagent. With strong HNO_3 a dark orange colour, ultimately becoming yellow, then fading, is produced.

Alkaloid "β" from the same menstruum, yielded coarsely granular crystals, melting sharply at 217°C.

Erepsin Ferment in Fungi. E. Delezenne and H. Mouton. (*Comptes rend.*, **136**, 633.) In addition to the kinase already isolated from certain Basidiomycetous fungi, the authors find that these also contain another ferment, similar to erepsin, which has

the property of splitting up peptones into simpler and crystalline products, causing the disappearance of the "biuret" reaction from their solutions. *Amantia muscaria*, *A. citrina*, *Psalliota campestris* and *Hypholoma fasciculare* were all found to contain this ferment. It was noted that *Psalliota campestris*, which does not contain much kinase, is very rich in the erepsin ferment.

Eriodendron anfractuosum, Fixed Oil of the Seeds of. L. Phillippe. (*Annales de Chim. Analyt.*, **8**, 18.) The seeds of *Eriodendron anfractuosum*, known as capock seeds, contain 24·2 per cent. of a clear liquid oil, having the sp. gr. 0·9237 and resembling purified cotton-seed oil in general characters. It is pale yellow in colour, and has a peculiar nutty flavour, resembling that of arachis oil. It is free from any toxic ingredient, and may be used as a food without producing any ill effects. The press-cake is rich in soluble nitrogenous matter, and contains 4·25 per cent. of total nitrogen. It contains no starch, but a sugar, as yet unidentified, which only reduces Fehling's solution after hydrolysis. The cake forms a valuable food-stuff for cattle. In addition to these valuable products the fruit is covered with a fine down, which is employed as a substitute for eider-down in making quilts.

The oil has the following constants: Sp. gr. 0·9237; iodine number, 75·5; free acids, 5·2 per cent.; Koettstorfer number, 196·5; soluble fatty acids, 0·37; Reichert number, 3·3; Hehner number, 95·4. The fatty acids melt at 35·5–36°C. and resolidify at 31·5°C. The acetylization number is 86. The fatty acids consist of 30 per cent. of palmitic acid, and 70 per cent. of liquid fatty acids, consisting of oleic acid and another as yet unidentified liquid acid. A marked difference was observed between the saponification number, 272, and the saturation number, 416·7, of the liberated fatty acids. This is due to the dehydration of these acids. When first liberated, the saturation number of the acids is in accordance with the saponification number of the fat, but after prolonged washing with boiling water the acidity of the former diminishes and the molecular weight increases. This behaviour is characteristic of capock oil. Other oils show a slight increase equivalent to 16 at the most, while the increase in the case of capock oil is represented by 130. In general characters capock oil approaches cotton-seed or olive oil, but its acetylization number is much higher.

Ether, Detection of Peroxides in. A. Jorissen. (*Répertoire*

[3], **15**, 166.) The following reagent is recommended for the detection of hydrogen or other peroxides in ether, as being more expeditious than the usually employed KI solution: 10 Cgm. of vanadic acid is treated, in a porcelain capsule, with 2 c.c. of concentrated H_2SO_4; the mixture is warmed for 10 or 15 minutes, cooled, a little water added, decanted, and made up to 50 c.c. with more water. When all the vanadic acid is dissolved the liquid is of a bluish-green colour, and will keep indefinitely. 1 or 2 c.c. of this reagent is added to 10 c.c. of the ether to be tested, and the mixture agitated. If peroxides be present a rose to blood-red colour will be developed, according to the amount of impurity present.

Eucalyptus Oil, Commercial. E. Dowzard. (*Chem. and Drugg.*, **61**, 520.) The most remarkable fact concerning present-day oils is the high cineol-content of a large number of commercial samples. The following table illustrates this:—

	Cineol Per cent.	Sp. Gr.	Rotation (100 mm.)
No. 1	80	0·9260	+ 0° 10′
No. 2	80	0·9250	+ 0° 20′
No. 3	74	0·9231	+ 1° 8′
No. 4	73	0·9236	+ 1° 50′
No. 5	73	0·9218	− 0° 54′
No. 6	71	0·9210	− 3° 0′
No. 7	69	0·9205	+ 3° 30′
No. 8	68	0·9212	+ 2° 38′

Eupatorium rebaudianum, Sweetening Properties of. (*Schweiz. Woch. für Chem. und Pharm.*, **40**, 213.) It is stated that the leaves of the *Eupatorium rebaudianum* possess remarkable sweetening properties, so that a few leaves added to a cup of coffee are sufficient to replace sugar. A few particles of the leaves, when masticated, give rise to an intense and persistent sweet taste. The sweet principle does not appear to be a fermentable sugar; its chemical nature awaits investigation.

Fat, Human, Constitution of. H. Jaeckle. (*Zeit. für Physiolog. Chem.*, through *Journ. Pharm. Chim.* [7], **17**, 37.) Human fat is found to agree in general composition with ordinary mannalian fat, although marked difference is found in the proportion of the constituents in different individuals. The average composition of the fat of adults is: Oleic acid, 70–81 per cent.; palmitic acid, 17–21 per cent.; stearic acid, 5–6·3 per cent., present

as glycerides; cholesterol, 0·244 per cent; lecithin, 0·073 per cent. The fat has the sp. gr. 0·9179; the saponification number 193–199, and the iodine number 62–73. The fat of infants contains less oleic acid than that of adults.

Fennel, Bitter, Essential Oil of. E. Tardy. (*Bull. Soc. Chim.* [3], **27**, 994.) *Algerian bitter Fennel oil.* The oil examined had the following characters: Sp. gr. at 0°C., 0·991; $[\alpha]_D = +62° 16'$. It was found to contain dextropinene, phellandrene, fenchone, methylchavicol, with a relatively small amount of anethol. From the fraction boiling between 180–195°C. a crystalline body melting at 140°C. was isolated, which proved to be thymohydroquinone.

Galician bitter Fennel oil differs from the above in being much richer in fenchone, and containing less methylchavicol. The original oil examined deposited a few crystals at −18°C.; its rotation was $[\alpha]_D = +39° 52'$. It contained dextropinene, dextrophellandrene, fenchone, methylchavicol, and relatively little anethol. The small amount of anethol found is probably due to the fact that Galician oils are generally deprived of that constituent, which is employed to sophisticate anise oil. Schimmels, in their Report (*Oct.*, **1902**, 43, 43), states that this Galician oil is not the normal product, but one from which stearoptene had been removed.

Fertilizers, Rapid Volumetric Method for Determining P_2O_5 in. A. L. Emery. (*Journ. Amer. Chem. Soc.*, **24**, 895.) The following method, containing modifications in manipulation of that published by the American Association of Official Agricultural Chemists, is claimed to give accurate results in about 30 minutes: Weigh 2 Gm. of the prepared sample into a 200 c.c. beaker, add about 10 c.c. strong hydrochloric acid, mix by shaking, wash down the sides of the beaker with about 10 c.c. of water, cover the beaker with a watch-glass, and boil briskly. With the watch-glass slightly raised, add slowly from 1 to 2 Gm. of sodium chlorate or enough to decompose the organic matter excepting fat. Boil off the excess of free chlorine. Dilute with water and transfer the contents of the beaker to a 250 c.c. measuring flask. Cool and make up to the mark. In cases where no fat is present, filtration is usually unnecessary, as a small amount of insoluble residue will not influence the titration. Transfer an aliquot part, say 25 c.c., representing 0·2 Gm. of the original sample, to a 200 c.c. Erlenmeyer flask, add 15 c.c. ammonia (sp. gr. 0·90) and a small piece of litmus paper. Neutralize the ammonia with strong nitric acid, using a slight excess only. The temperature of the solution

is now about 65°C. If more than 2 or 3° above this temperature add cold water to bring it down to 65°C. Now add from 25 c.c. to 75 c.c. ammonium molybdate solution, depending on the amount of phosphorus pentoxide in the sample, and shake vigorously by hand. Mechanical shaking is of but slight advantage. The precipitate will settle out clear very quickly. Filter with suction through a 9 cm. filter-paper. Wash the precipitate free from acid with water, making no effort to remove the precipitate from the flask. The washing will take about two minutes. Test the filtrate by adding more ammonium molybdate solution and heating to 65°C. Transfer the precipitate and filter-paper to the Erlenmeyer flask, and run in standard alkali until the yellow precipitate is nearly dissolved. Shake to disintegrate the filter-paper. Now add 1 c.c. phenol-phthalein solution as indicator and continue adding the alkali cautiously until the pink colour remains permanent for about a minute. The end-reaction is very sharp. In case an excess of alkali is added, it can be titrated back with standard acid. Divide the burette reading by two and the result will be the per cent. of P_2O_5 in the sample.

Preparation of Reagents.

(*a*) Molybdic Solution: This solution is made as directed in Bulletin No. 46, Revised Edition, U.S. Department of Agriculture, Division of Chemistry, except that the solution is heated for 5 hours in a bath of water at a temperature of 65–67°C.

(*b*) Standard Potassium Hydroxide Solution: This is prepared by diluting 323·81 c.c. of normal potassium hydroxide, free from carbonates, to 1 litre. 1 c.c. is equal to 1 mg. phosphorus pentoxide.

(*c*) Standard Sulphuric Acid Solution: The strength of this solution is the same as that of the standard alkali.

(*d*) Phenol-phthalein Solution: 1 Gm. of phenol-phthalein is dissolved in 100 c.c. of 50 per cent. alcohol.

Fireweed and Erigeron, Essential Oils of. Lyman F. Kebler, and G. R. Pancoast. (*Amer. Journ. Pharm.*, **75**, 216.) True oil of American fireweed, *Erecthitis hieracifolia*, is but rarely met with, since the distillation of the oil is in the hands of ignorant farmers, to whom at least six species of composite weeds are known as "fireweed." In 1887 Todd gave the sp. gr. of the genuine oil as 0·845–0·858, and the $[\alpha]_D = -4°$ to $+4°$. Later, Power examined the oil, giving the constants as being, sp. gr. 0·838 at 18·5°C., and

$[\alpha]_D = -2^\circ$ to $+2^\circ$. The authors have lately met with but two specimens which approximated to these figures. One had the sp. gr. 0·8422, the $[\alpha]_D = +1^\circ 32'$, and was soluble in an equal volume of alcohol. The other had the sp. gr. 0·8244, $[\alpha]_D = +2^\circ 12'$, and was insoluble in alcohol.

Commercial erigeron oil appears to be much adulterated; of six specimens examined, the $[\alpha]_D$ of the lowest $= +28^\circ 48'$; of the highest, $+84^\circ 28'$. The sp. gr. ranged from 0·8549–0·8904.

Fluorine, Liquid, Some Reactions of. H. Moissan and J. Dewar. (*Comptes rend.*, **136**, 785.) Liquid fluorine at −187°C. does not combine with iodine, although that element takes fire in the gas at ordinary temperatures. Liquid oxygen mixes with liquid fluorine without combination, and the components of the mixture again volatilize at their respective boiling points. Sulphur at once combines, with a vivid blue flame; the quartz tube in which the liquid fluorine is contained is cracked by the heat evolved, while the sides of the apparatus are covered with crystals of sulphur hexafluoride, which soon volatilizes. Selenium combines with even greater explosive violence, but tellurium is inert. Liquid nitrogen gives rise to no combination. Amorphous phosphorus and arsenium both combine with incandescence, but antimony remains untarnished in contact with liquid fluorine. Carbon in its various forms, boron and silicon, are inert; although particles of lampblack or charcoal when falling through the atmosphere of gaseous fluorine, over the surface of the liquid, take fire, yet they are immediately extinguished on entering the fluid. Sodium in contact with liquid fluorine remains bright, but is coated superficially with a transparent layer of sodium fluoride. Arsenious anhydride, silica and boric anhydride provoke no action with liquid fluorine, but lime combines with it with explosive violence. Calcium carbide, morphine, iodoform, sugar and mannite are all inert in the liquid, but anthracene gives a violent reaction. It is evident, therefore, that the low temperature −187° has no effect, in certain instances, in retarding the energy of chemical affinity. The delicacy of manipulation necessary in conducting dangerous experiments of this nature is made evident when it is borne in mind that all bodies cooled to −100°C. become intensely hygroscopic, so that in ordinary atmospheric air, containing aqueous vapour, they are at once surrounded by a thick coating of ice. Moreover, even the most minute trace of moisture must be excluded, since its presence

would profoundly modify the reactions. Further, the superficial reaction which takes place in some instances, by forming a protective layer round one of the substances employed, may arrest further combination; and practically nothing is known of the solubility of simple bodies in liquefied gases. In the experiments recorded, the liquid fluorine was contained in a quartz tube; the substance added, previously rendered absolutely dry, was enclosed in a sealed tube of smaller diameter, and reduced to a very low temperature in liquid air at $-190°C$. By fracturing the pointed end of the sealed tube, inserting it over the liquid fluorine, and partially inverting it, small portions of its contents could be projected into the liquid.

Fluorine, Solid. H. Moissan and J. Dewar. (*Comptes rend.*, **136**, 641.) By exposing fluorine, absolutely free from HF, in which state it is free from action on glass, in a sealed glass tube to gradual cooling in the vapour of liquid hydrogen, the gas is gradually condensed to a yellow liquid. On plunging the tube completely into the liquid hydrogen, the liquid fluoride solidifies to a mass which is at first yellow, but becomes colourless as the temperature falls. In this respect it resembles sulphur, bromine and chlorine, which also lose their characteristic colours at about 20·5° above absolute zero. The melting point of solid fluorine is about 40° absolute, or $-223°C$. It is found to retain its powerful affinity for hydrogen even at a temperature as low as 20·5°C. absolute, or $-252°C$. When a minute particle of solid fluorine was brought into contact with liquid hydrogen, both at that temperature, chemical union took place with explosive violence, shattering the containing tube and setting fire to the hydrogen. Physicists have advanced the theory that at absolute zero all matter is inert and chemical affinity ceases. It is evident that with fluorine and hydrogen, in close proximity to that temperature, the force of chemical affinity is but little, if at all, diminished.

Formaldehyde, New Process for Determination of. A. Pfaff (*Chem. Zeit.*, **26**, 701, through *Chem. Centr.*, **1902** [2], 76.) The method is based on the reaction between hydrazine hydrate and formaldehyde, by which the condensation product formalazin, is produced, $2CH_2O + N_2H_4H_2O = C_2N_4H_2 + 3H_2O$.

10 c.c. of approximately 0·4 per cent. formaldehyde solution (such as is obtained by diluting 10 c.c. of commercial formalin to one litre) is treated with an excess of solution of hydrazine sulphate, of known strength, allowing the mixture to stand for half-an-hour

in a closed vessel, then determining the amount of unused hydrazine. The hydrazine solution is titrated, using methyl orange as an indicator, with N/10 H_2SO_4 solution; each mol. of H_2SO_4 being equivalent to two mols. of hydrazine, which it converts into diammonium semi-sulphate $(N_2H_4)_2H_2SO_4$.

Formaldehyde, Simple Method of Titration. H. Schiff. (*Pharm. Zeit.*, **1903**, 109.) Dilute 10 c.c. of the formaldehyde to 200 c.c. with water, and neutralize the solution. Dissolve 0·5 Gm. pure ammonium chloride in 3–4 c.c. water, add 10 c.c. of the diluted formaldehyde, and titrate with potassium hydroxide, using litmus as indicator, as for an acidimetric titration. The calculation is based upon the following equation: $2NH_4Cl + 3CH_2O + 2KOH = N_2(CH_2)_3 + 2KCl + 5H_2O$. Since $2KOH = 3CH_2O$, one c.c. of N/KOH is equivalent to 0·045 Gm. of formic aldehyde.

Fousel Oil, Determination of in Alcoholic Liquids. E. Bechmann. (*Zeits. Untersuch. Nahr. und Genussm.*, **4**, 1059, through *Annales de Chim. Analyt.*) 20 Gm. of pure fused and granulated $CaCl_2$ is introduced into a separator with 50 c.c. of the spirit to be examined, which should not exceed the alcoholic strength of 50 per cent. by volume. After agitation to dissolve the $CaCl_2$, and cooling in a current of water, 30 c.c. of CCl_4 is added and well shaken for 14 minutes. After standing for separation, the CCl_4 layer is drawn off into another separator containing 20 – 25 c.c. of water. Three more successive shakings out, each with 20 c.c. of CCl_4, are performed on the alcoholic solution, the separated solvent being added to that already obtained. The bulked CCl_4 extract is then shaken up with the water for 5 minutes to remove the trace of ethyl alcohol carried into solution, the separated water is run off and the small amount of higher alcohols dissolved in it recovered by adding 10 Gm. of fused $CaCl_2$, and again shaking out twice with 40 Gm. of CCl_4. The bulked CCl_4 extracts are then dried by shaking with a little fused $CaCl_2$ until the liquid is clear. It is then filtered through glass wool into a stoppered flask, the filter being washed with a little dry CCl_4. The alcohols in solution are then esterified by the addition of $NaHSO_4$ 3 Gm., and $NaNO_2$ 3 Gm. Nitrous acid is given off almost at once; the mixture is left in contact for half an hour, then filtered through glass wool into another flask, washing the filter, as before, with CCl_4. $NaHCO_3$ 3 Gm. is then added, and when CO_2 ceases to be evolved, enough water is added to dissolve the excess of the salt, and the CCl_4 again

separated. The nitrous ethers contained therein are then saponified by agitating with several successive portions of H_2SO_4, and transferred to a flask containing 100 c.c. of water and some pieces of ice. The separator is washed out with a little ice water, the washings added to the dilute aqueous acid solution, and the nitrous acid determined therein by titration with N/100 $KMmO_4$ solution. If the original alcoholic solution contains aldehydes, these must first be removed by shaking the first CCl_4 extract with bisulphite solution.

Gardenia, Essential Oil of. E. Parone. (*Boll. Chim. Farm.* **41**, 489, through *Chem. Centr.*, **1902** [2], 703.) By macerating fresh gardenia flowers in liquid vaseline oil, shaking out the essential oil with absolute alcohol, treating the alcoholic extract with a 16 per cent. solution of Na_2SO_4 and shaking out the last traces of oil with ether, 176 Gm. of clear, yellowish oil was obtained from 250 kilos of flowers. This had the sp. gr. 1·009; b.p. at 755 mm., 204°C.; $[\alpha]_D + 2{\cdot}94$. Under reduced pressure (12–15 mm.) it was separated into the following fractions: (*a*) 25 Gm., b.p. 84–91°C.; (*b*) 114 Gm., b.p. 91–104°C.; (*c*) 12 Gm., b.p. 104–150°C. The following constituents were identified in the oil; benzyl acetate, styrolyl acetate, linalol, linalyl acetate, terpineol, and methyl anthranilate. A trace of benzoic acid was also present in the form of ester. The chief constituent is benzyl acetate, but the characteristic odour is due to the styrolyl acetate, $C_6H_5CH(OC_2H_3O)CH_3$.

Genista tinctoria, Essential Oil of. (*Haensel's Quarterly Report*, *Oct.*, **1902**, **7**.) The dried flowering herb of *Genista tinctoria* yields to steam distillation 0·0237 per cent. of a dark brown, concrete, essential oil, having an aromatic, pleasant odour, and the sp. gr. 0·8980. It reddens blue litmus paper, is readily soluble in ether, chloroform, benzol, carbon disulphide, or amyl alcohol, is partially dissolved in acetic ether, absolute or 90 per cent. alcohol. It melts at 36°C. and recongeals at 31°C. It begins to distil at 80°C.; about 5 per cent. comes over at 100°C. This fraction is of a deep yellow colour; a further 10 per cent. distils between 100 and 210°C. The main fraction distils at about 280°, except a trace of residue, which resinifies.

Gentiobiose, Action of Soluble Ferments and of Top Yeast on. E. Bourquelot and H. Hérissey. (*Comptes rend.*, **135**, 399.) The liquid ferment of *Aspergillus* completely hydrolizes gentiobiose. Invertin is without action on it; emulsin, however, causes a slight

hydrolysis, which appears to be due to a trace of some other ferment accompanying emulsin in almonds. Top yeast has no action on gentiobiose.

Gentiobiose, Crystalline. E. Bourquelot and H. Hérissey. (*Journ. Pharm. Chim.* [6], **16**, 417.) It has previously been shown (*Year-Book*, **1901**, 66) that the hexotriose, gentianose, when boiled with 2 per mille H_2SO_4, or treated with invertin, is hydrolized, forming levulose (fructose) and gentiobiose. The latter was at first considered to be amorphous, but it has since been found that it is crystalline, separating, on prolonged standing, in well defined crystals.

From methylic alcohol it separates in white, bitter, very hygroscopic crystals, which contain two molecules of CH_3OH of crystallization, and are stable *in vacuo* over H_2SO_4. On heating, they melt in their alcohol of crystallization at 85·5°C.

From ethylic alcohol gentiobiose crystallizes in long white prisms, which are also bitter. When dried over H_2SO_4 *in vacuo*, it does not melt below 100°C., like the crystals obtained from methylic alcohol; after heating to constant weight at that temperature it melts at 190–195°C., but not very sharply. Its optical rotation is $[\alpha]_D = +9° 82'$. The crystals obtained from methylic alcohol, which exhibit the phenomenon of multi-rotation, the dextrogyre action varying considerably with the time elapsing between solution and observation, have a specific rotation, $+ 3° 33'$. But since these crystals are known to contain 15 per cent. of methylic alcohol, this deviation is only apparent. When allowance is made for this, the rotation figure is practically identical, $+9° 8'$.

In reducing power on Fehling's solution 0·081 Gm. of gentiobiose is equivalent to 0·050 Gm. of invert sugar. Two per mille H_2SO_4 is practically without action on gentiobiose, but a 2 per cent. solution completely hydrolizes it into two molecules of dextrose.

Glycerides, Complex, in Natural Fats. D. Holde and M. Stange. (*Berichte*, **34**, 2402; **35**, 4306.) In 1899 Blyth and Robertson found in cacao butter the compound glyceride $(C_3H_5)(C_4H_7O_2)(C_{18}H_{33}O_2)(C_{16}H_{31}O_2)$, that is, an oleo-butyro-palmitin. (See also *Year-Book*, **1902**, 49.) The authors find that similar complex glycerides are present in other natural fats. By cooling an ethereal solution of olive oil to a temperature between $-48°$ and $-50°C.$, by means of a mixture of alcohol and liquid carbonic acid gas, collecting and washing the solid portion with ether at $-30°$ to $-35°C.$ and repeating the solution and freezing several times, a solid

glyceride is obtained, melting at 30–31°C. which has the formula $(C_3H_5)(C_{17}H_{33}O_2)_2$ $(C_{18}H_{33}O_2)$; it is, therefore, oleol-dimargarol glyceride, the margaric acid having the formula $C_{17}H_{34}O_2$; two such acids are known; one prepared synthetically by Krafft, and the other found in the oil of the seeds of *Datura stramonium* by Gérard. The acid from olive oil does not appear to precisely agree with either; it may be a mixture of two isomers. On further cooling the original ethereal solution of the oil to a lower temperature, −60°C., another glyceride was isolated, containing two molecules of oleic acid, with one molecule of a solid acid, either palmitic or margaric acid.

Glycerin, Determination of in Wine. A. Trillat. (*Comptes rend.*, **135**, 903.) 50 c.c. of wine is evaporated in a small silver dish on the water bath at 70°C. to one third of its volume. 5 Gm. of animal charcoal is then added, intimately mixed with the residue, and evaporation continued to complete dryness. After cooling, this residue is mixed with 5 Gm. of quicklime. The powder thus obtained is transferred to a flask and agitated for 5 minutes with 30 c.c. of pure dry acetic ether. The liquid is decanted and filtered, and the powder extracted twice more with the same quantity of solvent. The acetic ether is then evaporated, in small quantities at a time, in a tared capsule on the water bath, then dried to constant weight at 60°C. and weighed. It may then be ignited and the ash weighed, this weight being deducted from that of the glycerin; but, as a rule, the amount of ash is so small that it may be disregarded.

Glycerin, Gasometric Determination of. A. Buisine. (*Comptes rend.*, **136**, 1082 and 1204.) When glycerin is heated with an alkali, it is decomposed, as Dumas has shown, according to the equation $CH_2OH.CHOH.CH_2OH + 2KOH = CH_3COOK + HCOOK + H_2O + H_4$.

The author finds that the reaction only proceeds thus when the temperature is between 220–250°C. Under these conditions he has obtained 480 c.c. of hydrogen from each Gm. of glycerin, the theoretical yield being 483·5 c.c. If the temperature be raised to between 250–280°C. a much larger volume of hydrogen 600 c.c. is obtained. The equation $2(CH_2OH.CHOH.CH_2OH) + 4KOH = 2(CH_3.COOK) + C_2O_4K_2 + 2H_2 + 10H$ indicates the theoretical volume of hydrogen as 603·4 c.c. The increased volume obtained at this temperature is due, as the author has

directly determined, to the decomposition of the potassium formate of the first reaction, thus: $2(HCOOK) = K_2C_2O_4 + H_2$.

Finally, by increasing the temperature to between 280–320°C., a further increase of the gas is obtained, each Gm. of glycerin then evolving 710 c.c. of hydrogen. This phase of the reaction may be represented by the equation $2(CH_2OH.CHOH.CH_2OH) + 6KOH = 2(CH_3.COOK) + 2K_2CO_3 + 2H_2O + 12H$. It results, in fact, in the decomposition of the potassium oxalate into carbonate, just as the formate of potassium in the first phase was converted into oxalate. This decomposition is responsible for the liberation of another two atoms of hydrogen thus: $K_2C_2O_4 + 2KOH = 2K_2CO_3 + H_2$.

Theoretically the amount of hydrogen evolved at this temperature from 1 Gm. of glycerin is 725 c.c. The author advocates the gasometric determination of glycerin by collecting and measuring the hydrogen evolved on heating it with alkali to the higher temperature, and has devised a special apparatus for the purpose, similar to that employed by him in wax analysis. Since 1 Mgm. of glycerin evolves 0·7 c.c. of hydrogen, the method is very sensitive and well adapted, accordingly, to the determination of small quantities of that alcohol.

In the subsequent note the employment of a higher temperature, 350°C., and a mixture of potash-lime is recommended for the quantitative determination of glycerin, the reaction being $C_3H_8O_3 + 4KOH = 2(K_2CO_3) + 6H + CH_4$, that is to say, each Gm. of glycerin gives 725 c.c. of hydrogen and 242 c.c. of methane or 967 c.c. of gas.

Grass Oil, Javan. (*Schimmel's Report, April,* **1903**, 22.) Under the name "Java lemon oil" samples of an essential oil have lately been examined, which differs in general characters from lemon grass and palma-rosa oil, but in properties more closely approaches citronella oil, although the odour is not precisely identical. The botanical source is unknown, but is presumably an *Andropogon*. The sp. gr. varied between 0·8809 and 0·8914; $[\alpha]_D = +10° 6'$ to $14° 52'$; refractive index, 1·46466 to 1·46684; total alcohols as $C_{10}H_{18}O$, 49·09 to 50·9 per cent. It is readily soluble in alcohol 80 per cent. The alcohol present does not appear to be geraniol. A aldehyde, lævocitronellal, was detected, this being the first time it has been recorded as a constituent of an essential oil. Cineol was detected and terpenes, with limonene, or that body mixed with dipentene.

Gratiola officinalis, Constituents of. F. Retzlaff. (*Archiv der Pharm.*, **240**, 561.) Continuing the researches of Vauquelin, Marchand and Walz, the author has succeeded in obtaining the active principles of *Gratiola officinalis* in a crystalline form. The powdered herb was mixed with an equal weight of alcohol 50 per cent. and made into a paste with freshly precipitated lead hydrate. The mass was then transferred to a percolator and extracted with alcohol 50 per cent. After removing the alcohol by distillation, the residual aqueous liquid deposited the crude glucoside on standing; this was washed, dried over H_2SO_4, and dissolved in absolute alcohol. After decolorizing the alcoholic solution with animal charcoal, the glucoside was precipitated with ether. This precipitate redissolved in alcohol 50 per cent., and recrystallized several times from that solvent, ultimately formed a snow-white crystalline powder composed of fine needles, gratiolin, $C_{43}H_{70}O_{15}$. It is sparingly soluble in water, very soluble in strong alcohol, and insoluble in ether. It is very easily hydrolyzed. It frits at 222°C. and melts at 235–237°C. It is present to the extent of 0·15 per cent. in the plant. On hydrolyzing by boiling a weak alcoholic solution with HCl, two crystalline bodies are formed, gratioligenin, $C_{37}H_{60}O_{10}$, and gratiogenin, $C_{31}H_{50}O_3$, as well as glucose. Gratioligenin is obtained pure by recrystallization from absolute alcohol. It forms white, tasteless crystals, melting at 285°C. Gratiogenin is a decomposition product of gratioligenin, resulting in the further hydrolysis of that body, and may be obtained by hydrolyzing gratioligenin with HCl. It is then separated as anhydrous rhombic tables, melting at 198°C. The hydrolysis of gratiolin may be represented by the following equation:

$$\underset{\text{Gratiolin.}}{C_{43}H_{70}O_{15}} + H_2O = \underset{\text{Gratioligenin.}}{C_{37}H_{60}O_{10}} + C_6H_{12}O_6$$

and

$$\underset{\text{Gratioligenin.}}{C_{37}H_{60}O_{10}} + H_2O = \underset{\text{Gratiogenin.}}{C_{31}H_{50}O_5} + C_6H_{12}O_6$$

Guaiacol, Some Reactions of. G. Guerin. (*Journ. Pharm. Chim.* [6], **17**, 173.) Alcoholic solution of guaiacol gives with a drop of ordinary ferric chloride solution a pure blue colour; with a solution of pure ferric chloride the colour is emerald green. Aqueous solutions of guaiacol give under like conditions a brownish turbidity.

If ammonia, followed by an alkaline hypochlorite, be added to an aqueous solution of guaiacol, a green colouration is developed on warming.

An aqueous solution of guaiacol, to which a few drops of a 10 per cent. solution of sodium nitrite has been added, gives an orange-red colour when treated with a drop of sulphuric or nitric acid.

An aqueous solution of guaiacol treated with a 1 or 2 per cent. solution of chromic acid gives a brownish colour and precipitate; with iodic acid in 1 or 2 per cent. solution it gives an orange-brown colour and throws down a brick-red precipitate.

Hops, Essential Oil of. A. C. Chapman. (*Proc. Chem. Soc.* **19**, 72.) The following constituents have been isolated from hop oil: humulene, myrcene, linalol, linalyl isononoate, a small quantity of a diterpene, and a geraniol ester. Myrcene and humulene comprise 80–90 per cent. of the oils examined. These had sp. gr. varying from 0·8403–0·8676, and $[\alpha]_D$ from $-0·08°$ to $+0·30°$.

Hops, Some Constituents of. M. Bamberger and A. Landsiedl. (*Zeits. ges. Brauw.*, **25**, 461, through *Chem. Centr.*, **1902** [2], 745.) A crystalline bitter acid, to which the hybrid name "α-hop bitter acid" has been given, is obtained as follows: The coarsely powdered hops are extracted at ordinary temperatures by maceration with petroleum ether. The extract is shaken out with $NaHCO_3$ solution, separated, and the acid liberated from the sodium salt as a yellow mass by the addition of mineral acid. This is dissolved in ether, the ethereal solution evaporated, the residue treated with alcohol, when a golden yellow solution of markedly acid reaction is obtained, which is coloured deep lilac red by Fe_2Cl_6, and gives precipitates with lead and copper acetates. The lead salt recrystallized from alcohol or acetone forms yellow felted needles. The acid, liberated from this salt by means of H_2SO_4 and dissolved in ether, forms an amber-coloured crystalline mass which melts at 56°C. From petroleum ether it crystallizes in small rhombohedra. The acid has the empirical formula $C_{20}H_{28}O_5$ or $C_{20}H_{30}O_5$. From the alcoholic solution, after the separation of the above lead salt, a further precipitate was obtained on the addition of water and lead acetate, which, when dried *in vacuo* and dissolved in ether, gave a lead salt having the formula $Pb_2O(C_{27}H_{37}O_7)_2$, and the elementary analysis of the acid liberated therefrom pointed to the formula $C_{27}H_{38}O_7$. The alcoholic solution of this acid had an intensely

bitter taste; it gave a deep yellowish brown colour reaction with Fe_2Cl_6 and a yellowish green precipitate with $Cu2C_2H_3O_2$.

Hydrastine, Determination of in Hydrastis canadensis. G. Fromme. (*Cæsar and Loretz's Report*, **1902**, through *Annales de Pharm.*, **8**, 499.) 6 Gm. of powdered hydrastis rhizome is agitated for 30 minutes with a mixture of ether, 50 Gm.; petroleum ether, 10 Gm.; and solution of ammonia (sp. gr. 0·960), 6 Gm. Water, 6 Gm., is then added, and agitation continued until the powder aggregates. 50 Gm. of the clear liquid (=5 Gm. of powder) is then filtered off. This ethereal extract is shaken out in a separator with three successive washings of 20, 10 and 10 c.c. of 1 per cent. HCl solution. The acid extracts are transferred to another separator, made alkaline with ammonia, and shaken out with three successive washings of ether. The ether is distilled off from the bulked ethereal extracts in a tared Erlenmeyer flask, and the residue dried to constant weight at 100°C., and weighed as hydrastine. The average yield should be from 4·01 to 4·34 per cent. on the dry drug. (Compare *Year-Book*, **1901**, 21 **1902**, 89.)

Hydrastinine, Reaction of, Identity for. A. Jorissen. (*Annales de Chim. Analyt.*, **8**, 126.) Hydrastinine, obtained by oxidizing hydrastine, is official in the *Ph. G.* iv. It is therefore useful to record a reaction by means of which the base or its salts may be readily distinguished from other alkaloids. This is afforded by its behaviour towards Nessler's reagent, which it instantly reduces, forming a black precipitate of mercury. The only other bases which behave in a similar manner are morphine and apomorphine, which, as might be expected, cause a more or less rapid reduction. Among the officinal glucosides, picrotoxin also has a powerful reducing action on Nessler's solution in the cold.

Hydrogen Peroxide, Crystalline. W. Stoedel. (*Pharm. Zeit.*, **47**, 154.) By subjecting hydrogen peroxide 95–96 per cent. to the cooling influence of methyl chloride or to that of a mixture of carbonic acid and ether, a solid mass is readily obtained. If the liquid be simply cooled to −8 or −10°C. and sown with the crystals obtained by the previously mentioned expedient, it is rapidly transformed into a mass of colourless transparent crystals. By successive crystallizations in this manner and decanting the mother-liquor, pure H_2O_2 may be obtained. This presents several interesting reactions. Spongy platinum introduced into the liquid causes explosion. Charcoal or magnesium powder burns brilliantly

when dropped on to the liquid. Reduced iron is not oxidized, but in the presence of a minute trace of manganese dioxide it burns with a brilliant flame. As a delicate reagent for H_2O_2 the author employs a solution of titanic acid in H_2SO_4, which gives a yellow tint with a solution containing only 1 : 800,000 of H_2O_2.

Hydrogen Tetroxide and Ozonic Acid. A. Bach. (*Mon. Scientif.* [4], **17**, 106, through *Chem. News*, **87**, 112. By decomposing tetroxide of potassium by dilute sulphuric acid kept at a very low temperature, the author has obtained a very unstable solution of peroxide, which, when titrated with permanganate of potash, gave an excess of 30 to 50 per cent. of oxygen, more than the amount of permanganate used ought to have given off with binoxide of hydrogen. In all probability this was the hypothetical tetroxide of hydrogen that should be formed by tetroxide of potassium under the action of sulphuric acid, exactly as, for example, binoxide of sodium gives rise to the binoxide of hydrogen: $Na_2O_2 + H_2SO_4 = Na_2SO_4 + H_2O_2$ and

$$K_2O_4 + H_2SO_4 = K_2SO_4 + H_2O_4.$$

Quite recently Baeyer and Villiger have published (*Berichte*, **1902**, xxxv., 3038) a note on "Ozonic Acid," which is very closely connected with this research. By passing a current of ozonized oxygen over caustic potash in powder, they obtained an orange-brown product to which they gave the name ozonate of potash, and which they looked upon provisionally as identical with tetroxide of potassium. The same body also appears to be formed when a current of ozonized oxygen is passed through potash lye kept at a very low temperature. The free "ozonic acid" corresponding to oxonate of potash would be, according to Baeyer and Villiger, the hydrate of ozone, $O_3 + H_2O = O_4H_2$.

It is easily seen that Baeyer and Villiger's ozonic acid is nothing else than the tetroxide of hydrogen. In fact, like the binoxide of hydrogen, tetroxide of hydrogen ought to possess acid properties and form well-defined salts. Of these salts we know already tetroxide of potassium and tetroxide of rubidium. But it is probable that the product obtained by Baeyer and Villiger is not tetroxide of potassium—judging from its manner of formation—but a product of the addition of 1 molecule of caustic potash to 1 molecule of ozone; that is to say, the acid salt of tetroxide of hydrogen, $KOH + O_3 = KO_4H$.

If this supposition is confirmed, the analogy between the salts

of binoxide of hydrogen and those of tetroxide of hydrogen would be complete.

H.O.O.H.	H.O.O.O.O.H.
Na.O.O.H.	K.O.O.O.O.H. (?)
Na.O.O.Na.	K.O.O.O.O.K.

From what has been said, it follows that the term "ozonic acid" must not be looked upon as synonymous with tetroxide of hydrogen.

Iceland Moss, Some Constituents of. O. Simon. (*Achiv der Pharm.*, **240**, 521.) In 1845 Knop and Schnedermann isolated crystalline cetraric acid from *Cetraria islandica.* In 1890 Hilger and Buchner stated (*Year-Book*, **1890**, 185) that they could not find this acid in a crystalline form; shortly afterwards Zopf reasserted its existence. In 1898 O. Hesse resumed the investigation, and stated that cetraric acid is non-existent in the plant, but that it is the decomposition product of another acid, protocetraric acid, which is split up into fumaric and cetraric acids. In reviewing the work, O. Simon confirms the statements of the original discoverers of the acid, Knop and Schnedermann. He finds that it exists in the plant in the free state. It is extracted by alcohol, and after purification crystallizes in white, silky, bitter needles which decompose at 200–230°C. before melting. They are anhydrous and optically inactive; they have the formula $C_{20}H_{18}O_9$. Cetraric acid is dibasic; with fixed alkalies it forms acid salts, but with ammonia and with lime it gives neutral combinations. It contains a carbonyl group and possesses aldehydic or ketonic functions; it also contains one methoxyl group. It is decomposed by reducing agents, yielding orcin among other products.

Fumaric acid was isolated from the ether washings of the alcohol extract in the process of purifying cetraric acid.

The protocetraric acid of O. Hesse was not found. The author, however, has isolated an acid for which he retains this name, although it is quite distinct from Hesse's acid, which is considered to be a mixture of true protocetraric, fumaric and cetraric acids. Pure protocetraric acid, $C_{19}H_{16}O_9$, contains no methoxyl group, and is not decomposed into cetraric and fumaric acid. It is obtained from the ethereal extract of the plant.

Illicium anisatum, Essential Oil of. E. Tardy. (*Bull. Soc. Chim.* [3], **27**, 990.) Chinese star anise oil is found to contain

dextro-pinene, lævo-phellandrene, methyl-chavicol, dextro-terpilenol, anethol, a lævo-sesquiterpene, anisic aldehyde, anisic ketone, anisic acid, a small amount of a crystalline body having the formula $C_{20}H_{22}O_3$, and a trace of hydroquinone ethyl ester. Although the amount of terpilenol present is small, it appears to have a marked influence in producing the characteristic odour of star anise oil.

Illicium Religiosum, Essential Oil of. E. Tardy. (*Bull. Soc. Chim.* [3], **27**, 987.) The essential oil was obtained from the fruits of the Japanese, or poisonous, star anise, *Illicium religiosum*, by extraction with petroleum ether and subsequent distillation *in vacuo*, to remove non-volatile fatty matter. The oil thus obtained does not in the least resemble that of *I. anisatum* in odour. Its $[\alpha]_D = -1° 50'$. It contains eugenol, cineol, safrol, possibly borneol, and another terpene alcohol which gave anisic acid when oxidized with $K_2Mn_2O_8$, which may be either anethol or methyl-chavicol. Neither aldehydes nor esters were present, but a small amount of what was probably a terpilene hydrocarbon was detected. (See also p. 33, *ante*.)

Iodine Pentafluoride. H. Moissan. (*Comptes rend.*, **135**, 563.) A current of pure fluorine free from HF was led, by means of a platinum tube, into a small boat containing pure dry iodine, the whole being surrounded by a glass tube, the extremity of which was drawn out and bent at right angles, the bent **U** thus formed being kept at 0°C. As soon as the fluorine came in contact with the iodine a dull flame was generated. To avoid a too high temperature, this part of the apparatus was surrounded by a small lead worm, through which a current of water was allowed to flow. In this manner volatilization of iodine was avoided. A colourless dense liquid collected in the cooled **U** tube, which soon began to solidify on the cold sides. The current of fluorine was gradually allowed to pass until the whole of the iodine had combined. The compound thus produced, in the presence of an excess of fluorine, is IF_5. It is a colourless liquid, solidifying at +8°C. When solid, it resembles camphor in appearance. It distils without decomposition; it is dissociated at between 400° and 500°C. In air containing aqueous vapour it gives off abundant irritating fumes. It distils in a current of hydrogen without reaction. Chlorine in the cold exerts no action on it; but on warming, it acquires a yellow colour. Bromine dissolves in it, in the cold, without combining; but, on warming the solution, the colour of bromine

disappears, and fluorine bromide and bromide of iodine are formed. Oxygen is without action on it at 100°C. Sulphur, when heated, forms gaseous sulphur hexafluoride and sulphur iodide with a little free iodine. Phosphorus reacts with energy and incandescence, liberating iodine and forming phosphorus pentafluoride. Arsenic and antimony behave in a similar manner, becoming incandescent and forming fluorides. Carbon attacks it in the cold, without incandescence; under like conditions silicon is inert, but on slightly raising the temperature violent reaction ensues. Boron immediately takes fire in contact with IF_5. The alkaline metals react with violence, but only when in a state of fusion, since when unmelted they are covered with a crust of fluoride and iodide which prevents further action. Silver, iron and magnesium are without action on IF_5, which may even be distilled over them without undergoing decomposition. In contact with water reaction takes place with the formation of HF and HIO_3, but without violence, although the temperature of the liquid is considerably raised. Potassium hydride becomes incandescent with IF_5, forming KF, KI and HF with free iodine. Silicon is slowly attacked in the cold, and more rapidly on warming; in the latter case abundant fumes of silicon fluoride are produced. All the compounds of silicon with metals are strongly attacked; calcium carbide is unattacked in the cold, but on warming it becomes incandescent. H_2SO_4 slowly decomposes IF_5. HNO_3 has no immediate action, but HCl occasions the violent evolution of gas, and the liquid acquires a yellow colour. Alkaline hydrates in solution instantly decompose, IF_5 forming their respective fluorides and iodates. With CS_2 it gives a deep violet solution, and reacts with violence with oil of turpentine. In benzol it appears to dissolve, but the solvent rapidly acquires a blue colour.

Iodoform, Preparation of with Acetylene. Octave Le Comte. (*Journ. Pharm. Chim.* [6], **16**, 297.) Corrosive sublimate, 100, is dissolved by heat in water, 1,000. After cooling, the solution is treated with a current of pure acetylene. The white precipitate formed, consisting of Kutscherow's chloro-mercuro-acetylene, Cl.Hg. CH:CH.Cl, is collected, washed free from soluble mercury salt with distilled water, and dried. The dry precipitate is then suspended in water, 50, and iodine, 2, is added, followed by the gradual addition of a 5 per cent. solution of caustic soda until the colour of the iodine is almost wholly discharged. Care must be taken to avoid excess of alkali, or decomposition results. The

yellow precipitate of iodoform is then collected, drained, and washed, first with water containing 1 per cent. of alkali to remove the free iodine, then with distilled water; this is followed by washing with a 1 per cent. HCl solution to remove any mercurous oxide, and, finally, by a washing with distilled water to remove the HCl. The iodoform thus obtained is dissolved in boiling absolute alcohol, filtered and crystallized.

Ipecacuanha Alkaloids, Certain Reactions of. A. H. Allen and G. E. Scott Smith. (*Analyst*, **27**, 346.) Attention is directed to the fact that the colour reaction of the alkaloids of ipecacuanha have a marked resemblance to those given under similar conditions by morphine, as shown in the following tables:—

COLOUR-REACTIONS OF THE ALKALOIDAL RESIDUES FROM AMYLIC ALCOHOL EXTRACTIONS.

Reagent.	Ipecacuanha Extract, No. 1.	Ipecacuanha Extract, No. 2.		Ipecacuanha Extract, No. 3.		Opium Alkaloids.
	Direct Process.	Direct Process.	Lead Acetate Process.	Direct Process.	Lead Acetate Process.	
Ferric chloride.	Blue, changing to green.	Blue, changing to green.	Indefinite.	Blue, changing to green.	Blue, changing to green.	Greenish blue.
Froehde's reagent.	Bluish-purple.	Purple.	Pink, changing to blue & green.	Violet-blue, changing to dirty pink.	Violet-blue, changing to dirty pink.	Purple
Froehde's reagent and hydrochloric acid.	Deep blue.	Deep blue.	Deep blue.	Deep blue.	Deep blue.	Purple (fading).
Starch and iodic acid.	Immediate blue.	Blue, changing to green.	Negative.	Negative.	Pink, changing to blue slowly.	Immediate blue.
Ferric chloride and potassium ferricyanide.	Immediate blue.	Immediate blue.	Immediate blue.	Immediate blue.	Immediate blue.	Immediate blue.

COLOUR-REACTIONS OF THE ISOLATED ALKALOIDS OF IPECACUANHA.

Reagent.	Emetine.	Cephaëline.	Psychotrine.
Ferric chloride	Indefinite.	Bluish-green. Indefinite.	Pale cherry red. Indefinite.
Froehde's reagent.	Dirty green. Bluish.	Pink, changing to green Reddish-purple.	Pale pink. Dull purple.
Froehde's reagent and hydrochloric acid.	Grass green.	Prussian blue.	Pale pink, changing to pale green.
Starch and iodic acid.	Negative.	Negative.	Blue.
Ferric chloride and potassium ferricyanide.	Gradual blue coloration.	Almost immediate blue. Immediate blue.	Immediate blue.

A most valuable means of detecting ipecacuanha alkaloids consists in the production of psychotrine in a crystallized form. Paul and Cownley describe the crystals as well-defined transparent prisms of a pale lemon-yellow colour. Under the microscope, psychotrine forms very minute crystals, which appear to belong to the regular system. Many of them appear to be octahedra, and closely resemble microscopic crystals of arsenious oxide. Other crystals present a remarkable resemblance to granules of rice-starch. Crystals of psychotrine for microscopic observation are readily obtained by shaking out an amylic alcohol or chloroform solution of the alkaloid with a little dilute acetic acid. The acid liquid is separated, concentrated if necessary, and placed in a watch-glass, or, preferably, on a microscope-slide furnished with a cell. A watch-glass or small beaker is then moistened internally with ammonia, and inverted over the alkaloidal acetate solution. After a time the vapours of ammonia are absorbed, and liberate the alkaloid in characteristic crystals, which are observed under the microscope. There is no occasion to employ pure psychotrine for the purpose, the crystals being readily obtainable from the mixed alkaloids of ipecacuanha.

Ipecacuanha, Determination of the Alkaloids of. G. Frerichs and N. de Fuentes Tapis. (*Achiv der Pharm.*, **240**, 391.) The authors thus modify Keller's method for determining the alkaloidal value of ipecacuanha root, substituting ether for the

ether-chloroform solvent of Keller, and thus avoiding the extraction of psychotrine. 6 Gm. of finely-powdered ipecacuanha root is shaken up in a flask with 60 Gm. of ether and 5 Gm. of solution of ammonia, or of sodium carbonate, 1:3. After well agitating for some time the mixture is allowed to rest for an hour, then treated with 10 c.c. of water, and the whole well shaken. After separation, 50 Gm. of ether is removed, equivalent to 5 Gm. of drug, and filtered into a small flask. Half the ether is distilled or evaporated off, and the residue, transferred to a separator, is shaken out with 10 c.c. of N/10 HCl solution. The acid liquid is then filtered into a 200 c.c. flask through a small filter. The ethereal liquid is again shaken out twice with 10 c.c. of water, each washing being run into the acid liquid through the same filter. The acid liquid is then made up to 100 c.c., enough ether added to form a distinct layer about 1 cm. deep, and the liquid titrated back with N/10 NaOH solution, using iodeosin, 1:250, as the indicator. Each c.c. of N/10 acid used up is equivalent to 0·0241 of mixed cephaeline and emetine. These alkaloids may be determined gravimetrically, if desired, by rendering the acid liquid alkaline with ammonia, shaking out with ether, evaporating the ethereal liquid in a tared capsule, drying the residue to constant weight, and weighing as emetine and cephaeline. The separate amounts of cephaeline and emetine present may be arrived at by means of a second determination, on similar lines to the above, but shaking out the ethereal extract of the mixed alkaloids with 10 c.c. of caustic soda solution; this removes the cephaeline. It is then only necessary to titrate or weigh the emetine left in the ether. The amount found, deducted from that of the mixed alkaloids in the first determination, gives the amount of cephaeline. Finally, to determine the psychotrine, a third determination, using ether-chloroform as a solvent, instead of ether alone, is made. The weight of total alkaloids thus obtained, less the weight of emetine and cephaeline resulting from the ether extraction method, gives the psychotrine.

Ipecacuanha, Indian, Constituents of. B. H. Paul and A. J. Cownley. (*Pharm. Journ.* [4], **15**, 256.) From the results of a recent examination of Indian ipecacuanha it would appear that, like the Bolivian root, this variety contains a preponderance of emetine.

The results of the analysis were as follow, compared with that of Rio and Columbian ipecacuanha ;—

Alkaloids.	Indian.	Rio.		Columbian.	
		Root.	Stem.	Two kinds.	
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Emetine	1·39	1·45	1·18	0·89	0·89
Cephaeline	0·50	0·52	0·59	1·25	0·95
Psychotrine	0·09	0·04	0·03	0·06	0·14
Total alkaloids . .	1·98	2·01	1·80	2·20	1·98

Expressed in a percentage form the relative proportion of each alkaloid is as follows:—

Alkaloids.	Indian.	Rio.		Columbian.	
		Root.	Stem.		
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Emetine	70·20	72·14	65·60	40·5	44·95
Cephaeline.	25·26	25·87	32·80	56·8	47·98
Psychotrine	4·54	1·99	1·60	2·7	7·07
Total alkaloids . .	100·00	100·00	100·00	100·00	100·00

The separated alkaloids had all the characters appertaining to emetine, cephaeline, and psychotrine.

It will be noticed that the Indian ipecacuanha resembles Bolivian rather than Columbian ipecacuanha. This is made more apparent from the preceding analyses.

For pharmaceutical preparations where the emetine contents may form the basis of standardization, Indian ipecacuanha appears to be of equal value to the Bolivian kind; eventually it may be ascertained that cephaeline is of some significance and to the advantage of the Columbian variety.

In the analysis of ipecacuanha precaution is necessary not only to ensure complete extraction of the alkaloids, but their satisfactory separation, so that they may correspond to the tests for purity in the manner we have previously described. In this connexion it may be remarked that no doubt many of the alleged discrepan-

cies in galenical preparations ascribed to the loss of alkaloid are to be attributed to faulty analyses rather than to an alteration in the preparation. There should be no difficulty in the matter of analysis if it is borne in mind that ether will extract the whole of the emetine and cephaeline, and that chloroform is unnecessary except for psychotrine, which, in an official preparation of Rio ipecacuanha, is hardly worth consideration. A liquid extract, for example, if made decidedly acid, then diluted well with water and cleaned with ether, will yield, when shaken out with ether and ammonia, a residue from ether which is in a fit condition for titration with decinormal hydrochloric acid. The result when expressed as emetine is sufficiently accurate for the purpose of the pharmacist, who will find no difficulty in making an analysis by this method. Operating in that way upon 20 cubic centimetres of a liquid extract, the quantity directed by the B.P. to be taken for standardizing, the ether residue obtained for titration would not be less than 0·4 Gm. If the pharmacist has prepared the liquid extract, the quantity of alkaloid found might be taken as that of ipecacuanha, without need of identification; but in the case of a bought preparation, some further test might be desirable. Unfortunately, the reactions of emetine, as well as those of cephaeline, are not sufficiently characteristic for the purpose of identification, and the reactions of a mixture of the two bases, such as would be obtained in standardizing, are even less distinctive. Probably the best method of identification would be to observe the crystallization of the emetine hydrochloride obtained after separating cephaeline, also to ascertain the insolubility of the greater part of the alkaloid in caustic alkali, as well as the ready solubility of the undissolved portion in ether, and the precipitation of cephaeline from the caustic alkali solution on adding some ammonium chloride. By that means some indications may be obtained as to the relative proportions of emetine and cephaeline, such as would show whether Brazilian or Columbian ipecacuanha had been used. Chloroform is a very unsatisfactory solvent in alkaloidal determinations, and ether should be substituted when possible. At the same time, if psychotrine is to be determined, then the ammoniacal liquid, after being extracted by ether, must be shaken out with chloroform.

The process above described is much preferable to that of the B.P., which comprises several sources of error. The separation of alcohol by evaporation might readily involve some destruction of alkaloid, especially in the presence of alkalinity. The precipita-

tion with basic lead acetate may also be attended with loss of alkaloid, besides being superfluous, and the weighing of a chloroform residue would give a result above the truth, because it would invariably contain some proportion of colouring material. The quantity of liquid extract to be taken for standardization is quite four times as much as is necessary for obtaining good quantitative results within a reasonable limit of time, so far as amount of alkaloid is concerned. With such a smaller quantity, however, the possibility of separating and identifying emetine and cephaeline, as above suggested, would be disproportionately decreased, since the quantity of alkaloid obtainable from 5 c.c. of liquid extract would not exceed 0·1 Gm.

Iodoform and Aristol, Notes on the Preparation of, by Means of Hypochlorites. F. Roques and A. Gerngross. (*Journ. Pharm. Chim.* [6], **16**, 211.) It is well known that the yield obtained in preparing iodoform from acetone, or dithymol di-iodide from thymol, by the action of sodium hypochlorite, sodium iodide and caustic soda, falls considerably below the theoretical amount. Cousin has noted that, as well as dithymol di-iodide, a chloro-compound of thymol is formed. The mother liquor, from which this compound is precipitated, contains, in addition to excess of sodium hypochlorite, $NaOH$, $NaCl$, and $NaClO_3$, according to the equation $2C_{10}H_{13}OH + 5ClONa = C_{20}H_{24}O_2Cl_2 + 2NaOH + NaClO_3 + 2NaCl$, but in the preparation of dithymol di-iodide the reaction is carried further, sodium iodate being formed by the action of $NaClO_3$ on KI; thus $NaClO_3 + KI = KCl + NaIO_3$. But it proceeds further. The excess of $NaClO$ reacts on the iodate formed, converting it into periodate, $NaIO_3 + NaClO + NaOH + H_2O = NaCl + Na_2H_3IO_6$. The presence of sodium periodate in the mother liquors of the preparation of aristol by this method is readily demonstrated. After neutralizing with HNO_3, the mixture is treated with $AgNO_3$ until the white precipitate begins to turn yellow. It is then filtered out, and more $AgNO_3$ added to the filtrate. A deep brown precipitate is thus obtained, which when dissolved in HNO_3 gives, on evaporation, yellowish-red crystals of silver periodate, which readily decompose on contact with water.

Iron Isopyrotritarate as an Indicator. L. J. Simon. (*Comptes rend.*, **135**, 437.) Among the products of distilling tartaric acid with potassium acid tartrate is a new body, $C_7H_8O_3$, isopyrotritaric acid. Ferric salts give with this an intense violet colour, due to the formation of iron isopyrotritarate, $Fe(C_7H_7O_3)$

which occurs in crystals containing 2 molecules of H_2O. It is readily soluble in water, forming deep brown or orange-red solutions. It affords a useful indicator in alkalimetry. With acids it gives in dilute solution a rose-violet tint. Alkalies cause a decolouration or change from deep orange to straw-yellow.

Isopyrum biternatum, Alkaloid of. G. B. Frankforter. (*Journ. Amer. Chem. Soc.*, **25**, 99.) The two bases, isopyrine and pseudo-isopyrine, isolated by Hartsten (*Chem. Centr.*, **1872**, 523) from the roots of *Isopyrum thalictroides*, have not been found in the tubers of *I. biternatum*, but a new base, isopyroine, has been discovered. The roots were cleaned, dried, pulverized, and extracted with hydrochloric acid (1:250). The extraction was made first by heating on a water bath for an hour and then allowing to stand for 12 hours. The acid solution was then filtered off and evaporated to about one-fifth of the original volume and re-filtered. The almost clear filtrate was then treated with ammonia. The precipitate formed, which, according to Harsten should contain the alkaloid isopyrine, was saved, dried, and extracted with ether. It proved to be only inorganic matter. The filtrate was then evaporated to dryness and extracted with alcohol. The alcoholic solution gave distinct alkaloidal reaction, but all attempts to isolate the free base failed.

The roots were now extracted with alcohol in the presence of hydrochloric acid for several hours and filtered. The filtrate was then condensed by evaporation, treated with ammonia, and filtered. The precipitate thus obtained was re-dissolved in hydrochloric acid, reprecipitated with ammonia, and filtered. This was added to the original filtrate, evaporated to dryness, and extracted with chloroform. The chloroform solution was treated with hydrochloric acid, and allowed to stand for several days. At the end of that time crystals had formed, which proved to be the hydrochloride of the alkaloid.

These crystals were removed, purified by re-solution and treatment with animal charcoal, and again crystallized from water. Thus obtained, the substance was a beautiful white felt-like mass of fine crystals. It is soluble in water and alcohol, but almost insoluble in ether.

Under the microscope, the crystals appear as long, fine, prismatic needles. The melting-point of the pure substance was found to be 255–257°C. The hydrochloride formed a well-crystallized platinum double salt. It is a bright yellow, granular substance,

insoluble in water, but slightly soluble in alcohol. It melts at 238°C.

The free base, isopyroine, $C_{28}H_{46}NO_9$. The hydrochloride was dissolved in a very small quantity of dilute alcohol, and sodium hydroxide cautiously added. The white flocculent precipitate formed was filtered off and dissolved in an excess of alcohol. On slowly evaporating the alcohol, the base was reprecipitated as a white, crystalline substance. These crystals had a sharp melting-point of 160°C. On drying at 100°C. the substance lost its crystalline nature and became a light grey powder. Analyses of the dried substance gave results pointing to the empirical formula, $C_{28}H_{46}NO_9$.

When treated with methyl iodide, isopyroine combines molecule for molecule, forming isopyroine methyl iodide, $C_{28}H_{46}(CH_3)NO_9I$.

Jasmin Oil, Synthetic. (*Pharm. Post*, **35**, 491.) A German patent has been granted for the preparation of synthetic jasmin oil, as follows: Benzyl acetate, 55; linalyl acetate, 15; linalol, 10; benzyl alcohol, 20.

Kœmpferia galanga, Essential Oil of. P. van Romburgh. (*Kon. Akad. van Wet.*, through *Schimmel's Report, April*, **1903**, 43.) Continuing his previous researches on kœmpferia oil (*Year-Book*, **1901**, 75), the author has isolated two new constituents, ethyl cinnamate, and a hydrocarbon, $C_{15}H_{32}$. This body and the ester had boiling points so closely adjacent that they could not be separated by fractional distillation; recourse was therefore had to the solubility of the latter in 80 per cent. alcohol. The hydrocarbon left insoluble was purified from the last traces of ester. It was then obtained as an inactive, odourless and colourless body, which solidified on cooling; b.p. 267·5°C.; sp. gr. 0·766 at 26°C. It answers all the characters of pentadecane. More than 50 per cent. of the liquid portion of kœmpferia oil consists of this paraffin.

Karaka Fruit, Glucosides of. T. H. Easterfield and B. C. Aston. (*Proc. Chem. Soc.*, **19**, 191.) The kernel of the fruit of the karaka tree, *Corynocarpus lævigata*, N.O. Anacardiaceæ, is a staple food among the Maoris and Morioris. In the raw state it is bitter and very poisonous, but when baked and soaked in water its toxic properties disappear. The kernels contain 15 per cent. of a harmless, non-drying oil, and the aqueous extract of the nut yields mannite, mannose, and dextrose. When distilled it gives a considerable quantity of HCN. From the aqueous extract Skey isolated a bitter glucoside, karakin, which, he stated, melted at 100°C., and contained no nitrogen. The authors, however, find that

karakin, when pure, melts at 122°C. and is highly nitrogenous. It is best isolated from the alcoholic extract of the kernels, by removing the alcohol under reduced pressure and recrystallizing the residue from water. It has the formula $C_{15}H_{24}O_{15}N_3$, crystallizes in leaflets, and like amygdalin, is only slightly toxic when removed from the enzymes which hydrolize it in the plant. A second glucoside, corynocarpin, is obtained by extracting with ether the aqueous extract evaporated below 50°C. It is probably derived from karakin by partial hydrolysis. It crystallizes in fine needles, melting at 140°C., and is less soluble in alcohol than karakin.

Kinase in Certain Fungi. C. Delezenne and H. Mouton. (*Comptes rend.*, **136**, 167.) Although ferments have been isolated from certain fungi which have the property of liquefying gelatin or of peptonizing casein, no body capable of digesting fibrin or egg albumin has been obtained from them. The authors find, however, that certain species contain a kinase, which, although without action alone, endow pancreatic juice with a marked digestive action on fibrin and ovalbumin. This body is analogous in its action to enterokinase, or to the ferment which is formed by certain bacteria, and which exists in snake venom. *Amantia muscaria* and *A. citrina* give this kinase in a state of great activity; it is also found, but less active, in *Hypholoma fasiculare*, and in a very inactive form in the edible fungi, and *Psalliota campestris* and *Boletus edulis*. It is not found in *Hydnum repandum*. It would appear, therefore, that the kinase occurs in the greatest activity in those fungi which are most toxic.

Kinoin, the Alleged Existence of in Malabar kino. E. White. (*Pharm. Journ.* [4], **16**, 676.) The author is unable to confirm the statement of Etti (*Year-Book*, **1879**, 153) that Malabar kino contains an ether-soluble crystalline constituent, named by him kinoin, to the extent of 1·5 per cent. Experimenting both with commercial Malabar kino, and with authentic specimens from the Government Indian Forests Department, only traces of an ether-soluble crystalline body could be isolated, which proved to be protocatechuic acid. Etti has also claimed from a qualitative test (the production of a green flame when the gases evolved by heating "kinoin" in a sealed tube with HCl are ignited) that "kinoin" contains a methoxyl group. The author shows, however, that authentic kino, when treated by Zeisel's method, gives no indication of the presence of a methoxyl molecule in its con-

stituents. Kremel (*Year-Book*, **1883**, 193) and Bergholz agree with the author as to the non-existence of kinoin.

Lactosin, A New Carbohydrate of Milk. F. Landolph. (*Répertoire* [3], **14**, 493, after *Nouv. Remèdes.*) According to the author, the mean percentage, 4·8, usually given as the amount of lactose in milk, is incorrect. The true lactose content never exceeds 3–3·3 per cent. This is the amount shown by the polarimetric method of determination, the higher figure being that obtained by the reducing action of the milk carbohydrates on Fehling's solution. The error in the latter is due to the presence in milk of 1·5 per cent. of lactosin, which reduces Fehling's reagent, but is optically inactive. It is this carbohydrate which is fermented by the koumyss or kefir ferment. Lactose alone is perfectly inert towards beer yeast, and is only fermentable after inversion on the water-bath with a mineral acid. This inversion involves the whole molecule, and the supposed splitting up into glucose and galactose does not occur. Inverted lactosin is found in the filtrate from the casein precipitated by the kefir ferment. When concentrated, this liquid is readily fermentable, and gives an alcoholic beverage of pleasant flavour. Lactose is never fermentable by the kefir ferment, nor is it inverted by this ferment nor by lactic acid, and the reactions attributed to this acid in milk are, in fact, due almost entirely to the presence of acid phosphates, chlorides and sulphates. Human milk is specially rich in lactosin, containing 2·5 per cent. or more, about half the observed reduction it effects on Fehling's solution, being due to the presence of this carbohydrate.

Lauric Acid and Some of its Derivatives. C. E. Caspari. (*Amer. Chem. Journ.*, **27**, 303, through *Review Amer. Chem. Research*, **8**, 532.) Of the sources of lauric acid thus far discovered, the seeds of *Lindera benzoin* yield it most abundantly and with comparatively little difficulty. Pure *lauric acid* melts at 42°C., and boils at 166°C. under a pressure of 10–11 mm. It is very soluble in alcohol, from which it crystallizes in warty crystals of satiny lustre. It is nearly insoluble in water. Its alcoholic solution reddens blue litmus. *Lauryl chloride* boils at 145°C. at 18 mm., and does not solidify at −17°C. It is decomposed slowly by the moisture of the air, and very quickly by alcohol. *Lauramide* crystallizes from 50 per cent. alcohol in fine, white, feathery needles, very fluffy and with the lustre of satin. It melts sharply at 98–99°C., and is insoluble in water. *Laurani-*

lide crystallizes from 50 per cent. alcohol in long, feathery, fluffy, white needles, like fine shredded asbestos. It melts at 76·5°C. *Laurotoluide* forms very fine, white, light needles, melting at 81·5°C., insoluble in water, readily soluble in alcohol. *Barium laurate* crystallizes from alcohol in rosettes of very fine white needles of nacreous lustre. It is very difficultly soluble in water or alcohol, and does not melt at 260°C. *Strontium laurate* crystallizes from alcohol in clusters of fine, white needles, which are very difficultly soluble in water or alcohol, and which decompose without melting at about 240°C. The crystals contain 1 molecule of water. *Calcium laurate* is much more soluble in alcohol than the barium or strontium salts. It crystallizes in very short, delicate, white needles of microscopic size, containing 1 molecule of water of crystallization, and melting at 182–183°C. The crystals are efflorescent. *Acid magnesium laurate* is very easily soluble, and crystallizes from 50 per cent. alcohol in very fine, white needles, melting at 74–75°C. It is apparently identical with the salt described by Oudemans (*Journ. Prakt. Chem.*, **89**, 206) as the normal magnesium laurate. The author found it impossible to prepare the normal magnesium salt. *Zinc laurate* is moderately soluble in alcohol, and crystallizes in rosettes of delicate white needles of pearly lustre, containing no water of crystallization, and melting at 127°C. *Copper laurate* forms a light bluish-green, micro-crystalline powder, insoluble in water and very difficultly soluble in alcohol. When heated, it gradually turns darker, finally becoming dark green. It does not melt at 200°C. *Lead laurate* is insoluble in water, but crystallizes from alcohol in delicate, white needles of pearly lustre, melting at 101°C. *Manganese laurate* is insoluble in water, but soluble in alcohol. It forms a pale pink, micro-crystalline powder, m.p. 76°C., and contains no water of crystallization. *Cobalt laurate* forms delicate, pale red needles, m.p. 52°C., which turn dark violet when fused. It is insoluble in water, but quite soluble in alcohol. The crystals contain 1 molecule of water.

Lavender Oil, Adulteration of with Salicylic Acid. J. E. Weber. (*Journ. Amer. Chem. Soc.*, **24**, 1027.) A French lavender oil, which, from the following constants, appeared to be of good quality: $d_{15°} = 0·893$, $[\alpha]_D = 6° 42'$, acid number $= 4·48$, ester content $= 35·52$ per cent. as linalyl acetate; soluble in 2·5 vol. and more 70 per cent. alcohol. The oil turned red after some time, something never observed before in lavender oil. This dis-

coloration was traced to salicylic acid, which evidently had acted on some defective parts inside the tinned cans.

The salicylic acid was isolated from the oil by shaking the same with a potash solution. Hydrochloric acid precipitated the organic acid from the alkaline solution. Another part could be obtained by extracting the filtrate with ether. The acid was purified by repeated fractional precipitation with hydrochloric acid from its alkaline solution, recrystallization out of chloroform and finally out of water with addition of some animal charcoal. The white crystals, now quite odourless, melted at 156–157°C. They were identified as salicylic acid by the characteristic violet coloration with ferric chloride solution and the odour of salicyl methyl ester by heating with methyl alcohol and sulphuric acid.

The acid number of the oil indicates 1·104 per cent. salicylic acid, but as some of the acid reaction is due to the natural oil probably about 1 per cent. of salicylic acid has been added, and this is an amount which it would hardly pay to put in. It appears, therefore, to be a test case, to see if the sophistication would be found out, with the intention of putting more in the next time, and also to use an oil of a poorer quality, anticipating that the analyst would neglect the acid number and calculate the whole saponification number for esters.

The oil did not contain any salicylic ester: no fraction of the oil, distilled *in vacuo*, gave a violet colour with ferric chloride solution.

An alcoholic solution of a pure lavender oil does not show any red or violet colour with ferric chloride, but an oil adulterated with salicylic acid will do so.

Lavender, French, Essential Oil of. (*Schimmel's Report, April,* **1903**.) The following constituents have been identified as occurring in French lavender oil: Valeric aldehyde, amyl alcohol, lævo-pinene, cineol, ethyl-amyl ketone, which bears an important part in the blend of odours, dextro-borneol, free geraniol, as well as geranyl acetate and caproate, coumarin, linalol, linalyl acetate, butyrate and possibly valerianate.

Lead Tetracetate, Tetrapropionate, and Tetrabutyrate. A. Colson. (*Comptes rend.*, **136**, 675.) The compound which is formed when red lead is treated at a temperature of 35°C. with glacial acetic acid is found to be lead tetracetate, $Pb(C_2H_3O_2)_4$. It forms a white magma, and may be obtained as long white

flattened needles by filtering off the mother liquor and exposing it to 12°C. for some hours. The combination is considered to be the compound anhydride of acetic acid and normal plumbic acid, $Pb(OH)_4$, since on contact with water it furnishes 4 mols. of acetic acid, $Pb(C_2H_3O_2)_4 + 2H_2O = PbO_2 + 4HC_2H_3O_2$. In a similar manner, lead tetrapropionate, $Pb(C_3H_5O_2)_4$, and lead tetrabutyrate, $Pb.(C_4H_7O_2)_4$ have been obtained.

Lead, Pharmacopœial Tests for. A. J. Cownley. (*Pharm. Journ.*, [4], **15**, 87.) The question lately raised as to the alleged presence of lead in acid potassium tartrate, B.P., has again directed attention to the unsatisfactory manner in which many tests for the detection of so-called impurities in medicinal preparations are described in the British Pharmacopœia. In some cases definite directions are given as to the test to be employed, whilst in other instances the method of testing is left to the discrimination of the operator, it merely being noted that such preparations should yield "no characteristic reaction" for certain mentioned impurities. Tartaric and citric acids, for example, have a definite test described for the detection of lead, and whether right or wrong, the article must answer to this requirement. But with potassium citrate, potassium tartrate and acid potassium tartrate it is merely stated that it should yield "no characteristic reaction with the tests for lead, copper, or iron," etc. On referring to the Pharmacopœia tests for lead, the analyst has the choice of five, any one of which, under certain conditions, might be described as yielding a characteristic reaction for lead, but with one exception are valueless for the detection of the metal in minute traces.

It cannot be urged that hydrochloric acid, diluted sulphuric acid, solution of potassium chromate, or solution of potassium hydroxide, four of the Pharmacopœia tests, yield "characteristic reactions" for lead when it occurs as a slight impurity. For the fifth test it is stated that hydrogen sulphide, in not very strongly acid solutions, "yields a black precipitate" insoluble in dilute hydrochloric acid, solution of potassium hydroxide, and solution of ammonium hydrosulphide. Hence it might be inferred that, in testing cream of tartar to ascertain whether it yields a characteristic reaction for lead, an aqueous solution of the salt which is "not very strongly acid" might be used for the application of the hydrogen sulphide test. As the solubility of cream of tartar is about 1 in 200, the amount of solution taken for analysis is at the option of the analyst, and might be: 20 c.c. or 0·10 Gm. of cream of tartar;

200 c.c. or 1·00 Gm. of cream of tar tar. Neither quantity would be very likely to give definite indication of a minute proportion of lead if the directions for testing given in the B.P. were followed, and consequently a considerable trace of lead might be overlooked.

It may be urged for the sanity of the Pharmacopœia that the test for lead as described under citric and tartaric acids, with the later modification as suggested, is to be presumed, but it is not officially stated so, and it is an open question whether such a claim could be substantiated.

It is certainly necessary that the above-mentioned preparations should be free from lead contamination, and an official test is required that will satisfy the pharmacist and at the same time not unnecessarily hamper the manufacturer.

Samples of cream of tartar, potassium tartrate, Rochelle salt, and tartaric acid lately examined showed the necessity of pharmacists examining these preparations, as, with suitable testing, the majority of them were found to be contaminated with lead in quantities ranging from 1 in 3,000 to 1 in 20,000. As 1 in 3,000 amounts to 2⅓ grain of lead per pound, it can hardly be considered within the margin of allowable impurity, especially if the Pharmacopœia definitions of those articles are meant to indicate its absence.

Lecithin, Determination of. Moreau. (*Répertoire* [3], **14**, 399.) In consequence of its high price, lecithin is apt to be adulterated with mineral phosphates. It should be entirely soluble in four times its weight of warm chloroform. Two or three Gm. thus dissolved should show no residue after standing for 12 hours. If there be any insoluble matter, this is collected, calcined with sodium carbonate, the calcination residue dissolved in dilute nitric acid and treated with ammonium nitromolybdate solution, when the presence of any added phosphates will be indicated by a precipitate. Having thus assured the absence of added phosphates, 1 Gm. of the lecithin is calcined with 2 or 3 Gm. of a mixture of potassium nitrate, 2, pure sodium carbonate, 1, and dried potassium carbonate, 1, the blowpipe being employed to burn off the last traces of organic matter. After cooling, the calcined mass is dissolved in distilled water, warmed with excess of HCl to drive off CO_2 and NO; neutralized with soda, rendered acid with acetic acid and made up to 100 c.c. with distilled water. The phosphorus is then determined in an aliquot part of this solution, in the usual manner, with uranium nitrate solution. Each one part of phos-

phorus thus found is equivalent to 11·4 of lecithin distearate. The whole process may be conducted in a quarter of an hour. *Granules and Pilules of Lecithin* are extracted with hot chloroform operating on the equivalent of 1 Gm. of lecithin. After extraction, the chloroform is distilled off, and the residue treated as above. *Lecithin in oil* is determined by calcining 5 Gm. of the oil with 10 Gm. of the above calcination mixture. The analysis is then conducted as previously indicated.

Lemon "Pips," Fatty Oil and Limonin in. W. Peters and G. Frerichs. (*Archiv der Pharm.*, **240**, 659.) If dried ground lemon or orange pips be extracted with ether, the yellow residual oil has a markedly bitter taste, due to the presence of the bitter principle, *limonin*, $C_{22}H_{26}O_7$. If the ethereal extract be allowed to stand, limonin is deposited in the form of colourless crystals. If low-boiling petroleum ether be employed as the extracting menstruum, the oil obtained is free from bitterness, and has the bland nutty taste of almond oil. It has the sp. gr. 0·900; iodine number, 109·2; total acid number, 188·4; acetylization number, 195·8; acetyl number, 13·65. It contains the glyceryl esters of oleic, linoleic, palmitic and stearic acids, as well as linolenic and isolinolenic acid. Limonin is best extracted by digesting the residual marc of the petroleum ether treatment with alcohol, purifying the alcoholic extract by treatment with alcoholic KOH. On the addition of HCl, limonin is obtained as colourless glittering scales, m.p. 275°C.

Lemon-grass Oil, Adulterated with Acetone. E. J. Parry. (*Chem. and Drugg.*, **62**, 768.) A specimen of lemon-grass oil, recently examined, was found to have the following characters: Sp. gr., 0·893; $[\alpha]_D = -1° 50'$; completely soluble in 3 vols. 70 per cent. alcohol; citral (apparent), 76 per cent.

Except for low sp. gr. there was nothing in these figures to excite suspicion; the high aldehyde-content and easy solubility were against the idea of adulteration with the decitralized residues of lemon-grass oil. The odour of the oil was, perhaps, a trifle abnormal, but no definite suggestion could be gathered from this.

50 c.c. was distilled under reduced pressure, and the adulteration was at once revealed. Some liquid commenced to come over at a very low temperature, so that the vacuum was broken and the distillation carried out under ordinary pressure. From the 50 c.c. 5·5 c.c. was obtained below 68°C. This small fraction had a distinct odour of its own, but was contaminated

with a lemon-grass odour also. On redistillation it came over between 55 and 60°C., and was soluble in water (with the exception of a slight turbidity), and gave a marked reaction with fuchsine and sulphurous acid. It is thus clearly acetone. Traces of a crystalline oxime were obtained from it, but not sufficient to determine the melting-point with any degree of accuracy.

So long as lemon-grass oil is pure, it should be valued and sold on its citral-content, in a similar way to cassia oil, but it is necessary to establish the purity of the oil before determining this figure. The odour of acetone would be a bar to its extensive use for adulterating oils, but acetone and acetin are undoubtedly dangerous compounds in the hands of a really skilled adulterator.

Lemon Oil, Constituents of. (*Schimmel's Report, Oct.*, **1902**, 39.) The following constituents have been hitherto recorded as occurring in lemon oil: Dextrolimonene, cymene (?), phellandrene, citral, citronellal, geranyl acetate, a sesquiterpene, octyl and nonyl. aldehydes, and pinene. Recent investigations add methyl heptenone, detected in the first fraction of the liberated bisulphite compounds, and terpineol, separated from the last fractions of the oil itself.

Leptospermum scoparium, Essential Oil of. C. E. Atkinson. (*Pharm. Journ.* [4], **15**, 369.) The small leaves of *Leptospermum scoparium*, of New Zealand, known by the native name of Manaku, yield a small amount of essential oil. It is of a brown colour, resembling moderately strong tea. It has an aromatic odour, and a harsh, astringent taste, suggesting eucalyptus. The sp. gr. at 12°C. is 0·916 and the boiling point about 260°C., while the freezing point is below −17°C. The colour reactions, after stirring with the reagent, were as follows: With H_2SO_4 (oil in CS_2), purple; HCl, pink; HNO_3, purple; NaOH, no action.

When submitted to fractional distillation the following four fractions were obtained:—

Fraction.	Boiling Pt.	Sp. Gr.
I.	223°C.	0·9105
II.	244°C.	0·924
III.	265°C.	0·941
IV.	280°C.	0·976

Bromine Absorptions.

Fraction.	Mean Percentage of Several Experiments.
II.	142·15 per cent.
III.	158·7 per cent.
IV.	92·05 per cent.

Saponification of Fraction II. gave the following figures:—

Wt. of Oil.	C.c. N/10 NaOH.	Saponif. Equiv.	Koettstorfer's No.
0·19 Gm.	2·5 c.c.	760	131·5

Lindera benzoin, Some Constituents of. C. E. Caspari. (*Amer. Chem. Journ.*, **27**, 291, through *Review Amer. Chem. Research*, **8**, 531.) The essential oil of the *bark* and *twigs* has the odour of winter-green, boils between 170–300°C., has the sp. gr. 0·923, and contains from 9–10 per cent. of methyl salicylate. The *leaves* yield 0·3 per cent. of a volatile oil, having the odour of lavender, and the sp. gr. 0·888. The oil from the *berries* contains about 4 per cent. of a volatile oil with a camphoraceous odour, boiling at 160–270°C., and the sp. gr. 0·850–0·855. The kernels of the seeds contain about 58 per cent. of oil, only a small portion of which is volatile. The fixed oil forms a solid yellow fat with a crystalline structure, m.p. 26°C. It is composed of a mixture of the glycerides of capric, lauric and oleic acid, lauric acid preponderating.

Lupinine. R. Willstaetter and E. Fourneau. (*Berichte*, **35**, 1901.) Lupinine gives analytical figures which agree with the formula $C_{10}H_{19}ON$, which is more in accordance with its boiling point, 257°C., than the formula attributed to it by Baumert, $C_{21}H_{40}O_2N_2$. It crystallizes from acetone in tables melting at 68·5–69·2°C. Its benzoyl ester, $C_{10}H_{18}N.O.CO.C_6H_5$, is much more toxic than the original base. It forms a definite compound with phenol iso-cyanate, and appears to have all the characters of an alcohol; the structure of the molecule is analogous to that of quinine and of cinchonine.

Lychnis flos-cuculi, Saponin in. F. Suess. (*Pharm. Post*, **35**, 569.) A case of poisoning from taking a decoction of flowering lychnis herb as a diuretic having come under notice, the author has investigated the constituents of the plant. As a saponin has already been recorded from the root, a similar glucoside was sought for and found in the ærial portions, to the extent of about 0·2 per cent. on the fresh herb. The name *lychnidin* has been given to this body, which is found to be very toxic, resembling cyclamin in its action.

Mafoureira Nut Oil. (*Bull. Imp. Inst.*, **1**, 26.) Mafoureira nuts from Portuguese East Africa are very rich in oil, containing as much as 61 per cent.; the kernels alone yield 68 per cent., the shells 14 per cent. The oil is solid at ordinary temperatures,

resembling, in this respect, coconut and palm oil. It melts at 37°C. and is chiefly composed of olein and palmitin, with some free fatty acid, chiefly oleic. It has been found to be highly useful for soap and candle making.

——	Melting point.	Solidifying point.	Acid value.	Saponification value.	Iodine value.
Fat from entire nuts	37°C.	20–25°C.	52·5	240	55·8
Fat from kernels only	40°C.	25–30°C.	42·4	241	47.8

Maisin, A New Albuminoïd from Maize. E. Donald and H. Labbé. (*Comptes rend.*, **135**, 744.) A new albuminoid, to which the formula $C_{184}H_{300}N_{46}O_{51}S$ has been attributed, has been isolated from maize flour. It resembles gluten, but has chemical properties quite distinct from wheat gluten. Maize flour is first deprived of fat by extraction with benzol, then treated with its own weight of anhydrous amylic alcohol. After about 8 hours' contact the amylic alcohol solution is treated with three times its volume of pure benzol, when the albuminoid is precipitated in white flocks, which are collected, washed with benzol and dried. Maisin is insoluble in water and in saline solutions. It is hydrolized by prolonged boiling with water. It is soluble in methylic and ethylic alcohols, and in acetone, more readily on heating than in the cold. It is precipitated from these solutions in a hydrated condition, adhering to the sides of the vessels, by ether, benzol, and hydrocarbons, and dries to a yellowish horny substance. It is soluble in very dilute alkaline solutions. It exists to the extent of 4–4·5 per cent. in maize flour.

Maize Oil, Sitosterol in. A. H. Gill and C. G. Tufts. (*Journ. Amer. Chem. Soc.*, **25**, 251.) It is found that maize oil does not, as stated by Hoppe-Seyler and Hopkins, contain cholesterol, but an analogous alcohol of lower melting point, which the authors have identified with the sitosterol found by Burian in wheat and rye. Maize oil sitosterol melts at 138°C., whereas cholesterol has the m.p. 146–147°; maize sitosterol acetate melts at 127·1°C., the benzoate at 142–142·5°C., and the propionate at 108·4°C. Not only are these melting points practically identical with those of sitosterol from wheat, but they also agree so closely with those of Reinstzer's hydrocarotin, as to point to the probability of this also being sitosterol. Sitosterol was extracted from maize oil first by shaking out with alcohol, then saponifying the alcoholic liquid, evapora-

ting off the solvent, drying the soap, and finally extracting the latter with ether. Thus obtained, it crystallizes from alcohol in what appears to be broad needles; microscopic examination shows these to be made up of thin laminæ, much longer than broad, and pointed at the ends. In a subsequent communication (*Journ. Amer. Chem. Soc.*, **25**, 251) it is stated that since the melting point of sitosterol acetate, 127·1°C., is higher than that of the phytosterol acetate in pure cotton-seed oil, 120–121°C., the authors claim to be able to detect an admixtu ə of 10 per cent. of maize oil by this test.

Manganese Aluminate. E. Dufau. (*Comptes rend.*, **135**, 963.) By heating together alumina and manganous oxide in the electric furnace, E. Dufau has succeeded in obtaining manganese aluminate, $MnAl_2O_4$, in the form of small, regular, octahedral, bright yellow crystals, having the sp. gr. 4·12. The fused mass obtained from the furnace has a fine green fracture, and shows numerous brown spots covered with pointed octahedral crystals. On treating this with HCl a crystalline powder is obtained, which is freed from graphite by immersion in methylene iodide, when the different density of the two solids effects their separation. Manganese aluminate, when heated in the air, readily oxidizes, becoming brown, but this oxidation is only superficial; on treating the heated particles with HCl they regain their normal yellow colour. Fluorine attacks it at red heat, but iodine and bromine have practically no action at the melting point of glass. Although unattacked by HCl, it is slowly decomposed by HF and by HNO_3, and very readily by H_2SO_4. Oxidizing agents decompose it with facility. The author considers that the brown product described by Ebelmann in 1847 was not pure, but was partially oxidized $MnAl_2O_4$.

Mandarin Orange Leaves, Presence of Methyl Methylanthranilate in. E. Charabot. (*Comptes rend.*, **135**, 580.) The essential oil of mandarin orange leaves, obtained by steam distillation, is a fluorescent liquid with a powerful odour; it has the $[\alpha]_D = +6° 40'$ and the saponification number 160. On adding 0.5 c.c. of the oil to 1 c.c. of a mixture of H_2SO_4 1, and ether, 5, crystals were formed and the mixture became converted into a solid crystalline mass. 60 Gm. of the oil was then shaken with 250 Gm. of H_2SO_4, 25 per cent. The insoluble portion weighed 30 Gm., showing that 50 per cent. of the original oil had gone into solution with the acid. The acid liquid was separated and

filtered, rendered alkaline with soda, while kept cool by means of ice, and shaken out with ether. The liberated ester was purified by recrystallization from petroleum ether at –15°C. Thus obtained, it presented the form of pearly crystals, m.p. 19°C., the solutions of which were strongly fluorescent even when very dilute. It was identified as being methyl methylanthranilate, giving methylanthranilic acid, m.p. 179°C., on saponification. The yield, 50 per cent., of methyl methylanthranilate is the highest yet recorded in any essential oil.

Manganese Silicides. P. Lebeau. (*Comptes rend.*, **136**, 89.) When copper, manganese and silicon, the latter in relatively small proportions, are fused together in the electric furnace, or when sodium, potassium fluosilicate, Mn_3O_4, and copper are similarly treated, the silicide, Mn_2Si, is formed. The button obtained is treated first with 50 per cent. HNO_3, then with 10 per cent. NaOH solution. Mn_2Si is thus obtained in brilliant quadratic prisms, having the sp. gr. 6·20. It scratches glass, but not quartz. Strong HCl dissolves it, but HNO_3 is without apparent action. It is slowly decomposed by dilute alkalies. If the same ingredients, but with a relatively greater proportion of silicon, be employed, the silicide, MnSi, is obtained. It forms fine tetrahedric, very brilliant crystals, having the sp. gr. 5·9. It is harder than Mn_2Si, scratching topaz, but not corundum.

Manna, Two New Sugars of. C. Tanret. (*Comptes rend.*, **134**, 1586.) According to the author, the two new sugars, manneotetrose and manninotriose, respectively $C_{24}H_{42}O_{21}$ and $C_{18}H_{32}O_{16}$, comprise from one-sixth to one-third the total weight of manna. To obtain them, mannite is first eliminated by taking advantage of its insolubility in cold alcohol, 70 per cent. Manna is dissolved in half its weight of boiling water, and sufficient strong alcohol added to bring the alcoholic strength of the solvent to 70 per cent. by volume. The mixture is set aside overnight, and then decanted from the mannite which has, in great part, crystallized out. The alcohol is distilled off from this liquid and the residue extracted, first with alcohol 95 per cent., then with 85 per cent., until the insoluble matter has a rotation $[\alpha]_D = +140$. This is then purified with excess of basic lead acetate, the precipitate removed, the filtrate freed from excess of lead with H_2SO_4, and the sugars converted into their respective barium compounds by dissolving in the liquid two-thirds as much crystalline baryta as there is original solid residue. The solution is then precipitated with alcohol, 80 per

cent., the precipitate collected, decomposed with CO_2, liberating the two sugars. By repeated fractional precipitation with alcohol of the barium compounds, and subsequent decomposition with CO_2, the two sugars are eventually obtained nearly pure. Manneotetrose crystallizes from water with 5 mols. H_2O. On hydrolysis it gives 4 monose molecules, 2 of galactose, 1 each of glucose and levulose, as shown by the equation $C_{24}H_{42}O_{21} + 3H_2O = 4(C_6H_{12}O_6)$. It melts at 167°C. Its solubility in water is 4 : 3; in alcohol 60 per cent. 1 : 14; in alcohol 70 per cent. 1 : 55; and in alcohol 80 per cent. 1 : 300. Its opt. rot. is $[\alpha]_D = +133° 85'$. When it has not been heated it does not reduce Fehling's solution, but it very readily becomes hydrolized, and then reduces that reagent. With mineral acids this hydrolysis occurs in two stages. First, one molecule of water is combined, forming levulose, and a new sugar, manninotriose, thus: $C_{24}H_{42}O_2 + H_2O = C_6H_{12}O_6 + C_{18}H_{32}O_{16}$; then the manninotriose, in its turn, combines with 2 mols. H_2O, thus: $C_{16}H_{32}O_{16} + 2H_2O = C_6H_{12}O_6 + 2(C_6H_{12}O_6)$. With acetic acid the hydrolysis does not go beyond the first stage; emulsin, diastase, and the ferments of *Aspergillus* act in a similar manner. Even water alone causes hydrolysis, so that the sugar cannot be completely dehydrated by heat, since it is then partially hydrolyzed by its own water of crystallization. Manninotriose existing in manna is doubtless derived from the hydrolysis of manneotetrose. It forms birefringent globules, but has not been obtained in a distinct crystalline form. It is dextro-rotatory, having the $[\alpha]_D = +167°$. Its reducing value on Fehling's solution is equivalent to 0·33 of glucose. The same author (*Bull. Soc. Chim.*, **27**, 947) gives the following percentage composition of manna:—

	Flake Manna.	Manna in tears.
Mannite	40	55
Water	10	10
Glucose	3	2·2
Levulose	3·4	2·5
Manneotetrose	16	12
Manninotriose	16	6
Salts	2	1·5
Resin	0·1	0·05
Still undetermined	9·5	10·95

(Compare *Year-Book*, **1886**, 225; **1890**, 503.)

Matico, Essential Oil of. G. Fromm and Van Emster. (*Berichte*, **35**, 4347.) The characters of an oil of authentic origin, examined by the authors, differ markedly from those previously recorded for the essential oil of *Piper angustifolium*. It had the sp. gr. 1·123 and contained neither matico-camphor nor asarone. About 70 per cent. of the oil consists of maticoic ether, $C_{14}H_{18}O_4$; sp. gr. at 17°C., 1·136; b.p., 282–285°C. It shows no characters of either an acid, phenol, ketone, lactone, aldehyde, or ester. It contains two methoxyl groups. On oxidation it yields maticoic aldehyde, $(OCH_3)_2.C_7H_3O_2.CHO$, and maticoic acid, $(OCH_3)_2.C_7H_3O_2.COOH$. Schimmels, in their *Report* (*April*, **1903**, 51), point out that the above oil, distilled by them, cannot be regarded as normal, since it consisted solely of the heavy portion of the oil distilled from the leaves. They have observed that matico containing a large admixture of fruits and inflorescences gives a higher proportion of heavy oil than that consisting of leaves only.

Menabea venenata, Toxicity of. L. Camus. (*Comptes rend.*, **136**, 176.) *Menabea venenata*, known to the Salakaves as "ksopo," is a highly toxic plant. The author has experimented with the alcoholic extract of the root, which, when dry, forms a yellowish, very bitter, hygroscopic powder, soluble in physiological salt solution. It has a powerful toxic action on dogs, more pronounced than on rabbits, acting on the nervous system and on the heart. The fatal dose for the dog is 6 Mgm. per kilo. of body weight, but sometimes 3 Mgm. is fatal. With rabbits the lethal dose is 8 Mgm. The nature of the poison has yet to be determined.

Mercury Lactates. M. Guerbet. (*Journ. Pharm. Chim.* [6], **16**, 5.) The lactates of mercury have previously been described by Engelhardt and Maddrel (*Liebig's Annalen.*, **63**, 95), and by Bruening (*ibid.*, **106**, 194), but the author finds that none of the compounds described by them are definite salts.

Mercurous lactate, $Hg_2 2C_3H_5O_3 + H_2O$. Engelhardt and Maddrel obtained what they considered to be this salt, to which they attributed the formula $Hg_2 2C_3H_5O_3 + 2H_2O$, in rose-coloured crystals by the double decomposition of strong solutions of sodium lactate and mercurous nitrate. The colour of these crystals is due to an impurity. They may be obtained quite colourless by the following process: The lactic acid employed is first boiled for half-an-hour with ten times its volume of water, to remove the

anhydrides, which are invariably present, as shown by Wislicenus, in the commercial syrupy acid. Mercurous oxide is precipitated by means of a cold solution of KOH from a cold solution of $HgNO_3$, the Hg_2O obtained being rapidly washed in the dark. The moist precipitate is then treated with just sufficient of the dilute lactic acid, in which it is immediately soluble, to dissolve it. The solution is evaporated at ordinary temperatures over H_2SO_4. The salt is deposited in the form of short, colourless prismatic needles, which respond to the formula $Hg_2 2C_3H_5O_3 + H_2O$. It is not completely soluble in water, a portion going into solution, the rest is precipitated as a white precipitate, which gradually turns grey. On warming the solution it blackens and deposits reduced Hg. The salt is, however, completely soluble in water containing $HC_3H_5O_3$.

Mercuric lactate, $Hg2C_3H_5O_3$. The salt described by Engelhardt and Maddrel is not a definite compound. It may be obtained pure by adding an excess of freshly-precipitated yellow HgO to lactic acid treated as described above, in which it is immediately soluble. The solution obtained is evaporated as described for mercurous lactate. In spite of precautions in the preparation of the HgO, and in saturating the acid with it to avoid rise of temperature, a little mercurous salt is invariably formed, which, however, being more soluble, remains in the mother liquor. To remove the last traces of this impurity, the crystals of mercuric lactate obtained must be cautiously washed with a little water. It forms bunches of colourless acicular prisms, which are very soluble (2·75 : 1) in water. Its aqueous solution, on boiling, although it undergoes no apparent change, is gradually converted into the mercurous state, evolving at the same time CO_2 and aldehyde, and liberating lactic acid. This curious reaction takes place according to the equation $2Hg(C_3H_5O_3)_2 = Hg_2(C_3H_5O_3)_2 + C_2H_4O + CO_2 + HC_3H_5O_3$

Metallic Sulphides, Modification of the Procedure in Separating. E. J. Mills. (*Chem. News*, **87**, 101.) In the usual routine of qualitative separation, the filtrate, after passing hydric sulphide, is boiled and treated with nitric acid. If any iron be present, oxidation is imperfect, and some of the ferrous iron passes through the next group, to be precipitated by ammonic sulphide as "traces of nickel." For many years the author has used bromine-water, which is a perfect oxidizer, instead of nitric acid. It also has this advantage—that the desired excess of it can be readily detected by sight and smell.

The precipitate with ammonic sulphide is generally very difficult to filter, owing to the presence of some sulphur compound, presumably the pasty hydric persulphide. The remedy usually prescribed is prolonged boiling. It is found that the addition of a few Gm. of sodium sulphite to the hot liquid (with precipitate) produces immediate clarification. As the metallic sulphides do not dissolve, this plan may be adopted for quantitative work.

Methyl Alcohol, Detection of, in Absinths and other Alcoholic Liquids. Senglé-Ferrière and Cuniasse. (*Annales de Chim. Analyt.*, **8**, 82.) 50 c.c. of the liquid is distilled over, the distillate acidulated with 1 c.c. of pure H_2SO_4, and treated with 5 c.c. of saturated solution of $K_2Mn_2O_8$. After allowing to stand for a few minutes the colour should be distinctly brown, without any reddish tinge due to excess of $K_2Mn_2O_8$. If this excess should occur it must be removed by the addition of a drop or two of solution of tannin. The liquid is then made faintly alkaline with Na_2CO_3, filtered, and treated with 2 c.c. of a 1 per mille solution of phloroglucin and 1 c.c. of strong solution of KOH. In the presence of added methyl alcohol a marked red colour reaction will be obtained. A slight yellowish red or violet tint may be disregarded, since a trace of methyl alcohol may occur in pure wine-alcohol; the reaction, due to added methyl alcohol, being bright red, is unmistakable. A confirmatory test may be obtained with gallic acid. The alkaline filtrate is acidified with a little dilute H_2SO_4; a few grains of gallic acid are dissolved in the liquid, when a few drops of strong H_2SO_4 are carefully run down to the bottom of the vessel. In the presence of methyl alcohol a blue colour will form at the zone of contact of the two liquids. It will be seen that these reactions depend on the formation of formaldehyde by the oxidation of the methyl alcohol.

Milk, Distinction of Raw from Boiled. Dupuoy. (*Bull. Soc. de Pharm. de Bordeaux*, through *Annales de Chim. Analyt.*, **8**, 140.) Crystalline guaiacol, in 1 per cent. aqueous solution, is recommended as a reagent for differentiating between raw and boiled milk. It is preferable to paraphenylene-diamine, which may also be used for the purpose, since it is more stable in solution, and may be kept for use, when dissolved, in yellow glass bottles. An equal volume of the reagent is added to the milk, and one drop of H_2O_2. Raw milk gives a pomegranate-red colour with the test, but boiled milk, or that which has been pasteurized at 80°C., gives no colour reaction. The colour produced is due to a

peculiar oxidizing ferment, lactanacroxydase, which is destroyed by exposure to a temperature of 80°C. This ferment liberates oxygen from H_2O_2, which then oxidizes the guaiacol, giving rise to the colour reaction.

Milk, Raw, Orthomethylaminophenol Sulphate as a Reagent for, and for Formaldehyde. J. E. Saul. (*Brit. Med. Journn.* [1], **1903**, 664.) On treating milk with a solution of orthomethylaminophenol sulphate [(OH).C_6H_4.NHMe], H_2SO_4, and then adding hydrogen peroxide solution, a very vivid deep red colour is produced. Milk that has been previously boiled and cooled remains uncoloured, a faint pink only developing on standing. The red colour is so strong and pronounced that so little as 1 per cent. of raw milk, if added to heated milk, may be detected with ease. A convenient way to apply the test is as follows: To 9 or 10 c.c. of the milk add 1 c.c. of a recently-prepared 1 per cent. aqueous solution of orthomethylaminophenol sulphate and then one drop of commercial hydrogen peroxide solution (*circa* 3 per cent.). The red colour develops within 30 seconds if there be any raw milk present in the sample. Any slight tint which may subsequently appear should be disregarded. It is important, to obtain the best results, that excess of hydrogen peroxide should not be added, as it tends to weaken and bleach the colour. Dilute acids do not affect the colour; caustic alkali destroys it. The presence in the milk of boric acid, borax, formaldehyde, sodium carbonate or bicarbonate does not interfere with the reaction. If the milk have become sour the acid should previously be neutralized.

It seemed interesting to note the temperature at which the active agent in the reaction was destroyed. Milk maintained at 70°C. for 1 hour still reacted readily; if kept at 75°C. for half-an-hour it failed to give the colour. It would appear that the milk loses its power to react at about the temperature at which enzymes are destroyed.

As difficulty may be experienced in obtaining the aminophenol derivative, it may be found convenient to use the photographic developing agent sold under the name of "ortol." The substance appears to be a mixture of orthomethylaminophenol sulphate with quinol. The latter body may be removed from it by extraction with ether. In practice, however, the presence of a small quantity of quinol may be ignored, as it does not interfere with the reaction; indeed, it may slightly assist it.

On adding 9 or 10 volumes of milk to a 1 per cent. solution

of orthomethylaminophenol sulphate, and allowing the mixture to stand, a pink colour is gradually produced in the presence of formaldehyde. The reaction is quite distinct where the milk contains 1 part in 100,000 of formaldehyde, or more. The length of time necessary for the tint to develop varies considerably with the temperature. On further investigation it appeared that the reaction is really an acceleration of the development of a colour which ultimately is produced in milk free from formaldehyde. This, and the fact that formaldehyde shares the property with other aldehydes and ketones, seriously diminishes its value as a test. It will not, therefore, compare with the modified sulphuric acid reaction of Hehner or the recent "amidol" (1:2:4—diaminophenol hydrochloride) test of Manget and Marion (*ante*, p. 24).

Morphine Acid Tartrate. A. E. Tanner. (*Pharm. Journ.* [4], **16**, 134.) In the course of the preparation of hypodermic injection of morphine by the official method, a portion of the morphine tartrate was found to be insoluble, and a further addition of tartaric acid not only failed to dissolve it, but caused a further precipitation of the same salt. This compound was examined, and was found to be morphine acid tartrate, $C_{17}H_{19}NO_3.C_4H_6O_6$; it is anhydrous, whereas the official neutral tartrate, $(C_{17}H_{19}NO_3)_2.C_4H_6O_6 + 3H_2O$, contains three molecules of water. The acid tartrate is relatively insoluble, requiring at least 100 parts for solution. Other organic bases will probably be found to give analogous acid tartrates.

Naphthalin in Essential Oils. H. von Soden and W. Rojahn. (*Pharm. Zeit.*, **47**, 779.) Naphthalin has been isolated from clove oil, and from the essential oil of storax bark. In the latter it was present in sufficient quantity to form an evident crop of crystals on the bark itself.

Narceine, Colour Reactions for. A. Wangerin. (*Pharm. Zeit.*, **47**, 916.) From 0·01 to 0·02 Gm. of resorcin and 10 drops of H_2SO_4 are heated, on the water bath, in a watch glass, with a few Mgm. of narceine; a fine red colour is soon developed, which is persistent, and changes to orange in twelve hours. On performing a similar test by substituting tannin for resorcin, a green colour is obtained, which is discharged on cooling, and diluting with water, but reappears on the addition of ammonia. Narcotine and hydrastine give similar reactions with tannin.

Narcotine and Codeine, Determination of in Opium. P. van

der Wielen. (*Pharm. Weekblad.*, through *Pharm. Zeit.*, **48**, 267.) *Determination of Narcotine.* 3 Gm. of powdered opium is shaken for a few minutes with ether 90 c.c., treated with 5 c.c. of 10 per cent. NaOH solution, and shaken occasionally for 3 hours. 3 Gm. of $CaCl_2$ is then added, and the mixture allowed to stand for 24 hours, when 75 c.c. (=2·5 Gm. of opium) of the clear ethereal layer is withdrawn. 60 c.c. of this is distilled off, and the residue transferred to a separator. The distillation flask is thoroughly washed out with 4 c.c. of water and 1 c.c. of dilute HCl, to dissolve any crystals which may have formed. This acid solution is then employed to shake out the ethereal liquid in the separator. The flask is again washed out with 5 c.c. of 2·5 per cent. HCl, and the ether again shaken out with the acid washing. The process is repeated until a portion of the acid liquid, being withdrawn, gives no precipitate with Mayer's reagent. The bulked acid solutions are transferred to a separator, made alkaline with 10 per cent. NaOH solution, and shaken out with ether. The ethereal extract is separated, and introduced into a flask containing 5 Gm. $CaCl_2$, with which it is well shaken up for 10 minutes, then filtered into a distillation flask. The residual $CaCl_2$ and the filter are repeatedly washed with successive 10 c.c.'s of ether, until a portion being withdrawn and evaporated leaves no residue which gives a precipitate with Mayer's reagent. The bulked ethereal liquid is then distilled, the residue dissolved in 4 c.c. of alcohol 90 per cent., and the alcoholic solution set aside for 24 hours to crystallize. The crystals which have formed are collected in a tared filter, washed with 5 c.c. of alcohol 90 per cent., dried at 100°C., and weighed as narcotine.

Determination of Codeine. The alcoholic mother liquor from the above crystallization of the narcotine and the washings of the crystals are diluted with 10 c.c. of water, and evaporated to 10 c.c. The turbid solution thus obtained is allowed to stand for 24 hours to deposit resinoid impurities. It is then filtered, the containing vessel and the filter are washed three times in succession with 5 c.c. of water. To the bulked filtrate and washings 5 c.c. of N/100 HCl solution is added, and 3 drops of hæmatoxylin indicator. The uncombined acid is then titrated back with N/100 NaOH. The amount of codeine combined with the acid is then calculated from the molecular weight, 317 = $C_{18}H_{21}NO_3 + H_2O$.

The author found in two specimens of Asia Minor opium, respectively: Morphine, 14·1 and 10·1 per cent.; narcotine, 5·84 and 2·82 per cent.; and codeine, 1·08 and 1·29 per cent. Persian opium was

found to be richer in narcotine and codeine, giving 8·37 per cent. of the former, and 1·51 per cent. of the latter, together with 12·4 per cent. of morphine.

Neroli Oil. A. Hesse and O. Zeitschel. (*Journ. Prakt. Chem.* [2], **66**, 481.) The following characters are given for normal neroli oil: Sp. gr., 0·870–875; $[\alpha]_D + 2° \ 50'–6°$; saponification value, 35–45 = 12–15 per cent. of linalyl acetate; acetyl value, 160 = 35–38 per cent. of free alcohols; methyl anthranilate, 0·5–0·7 per cent.; solubility in 80 per cent. alcohol, 1:1 – 1:2. Most oils when mixed with 4–6 vols. of alcohol 80 per cent. become cloudy owing to precipitation of a paraffin. This crystallizes in lustrous scales, and is doubtless identical with neroli-camphor or "aurade." It is odourless. Neroli oil contains about 35 per cent. of terpenes, consisting of pinene, camphene and dipentene; 30 per cent. of lævo-linalol; 7 per cent. of lævo-linalyl acetate; 2 per cent. of dextro-terpineol; 4 per cent. of nerol and geraniol; 4 per cent. of neryl and geranyl acetate; 6 per cent. of the sesquiterpene dextro-nerolidol; 0·6 per cent. of methyl anthranilate, and less than 0·1 per cent. of indol with traces of free acetic and palmitic acids.

Neroli Oil, Constituents of. (*Schimmel's Report, Oct.*, **1902**, 54, and *April*, **1903**, 53.) In addition to the constituents already recorded, the following have been detected in neroli oil: Lævo-pinene; lævo-camphene; dipentene; decylic alcohol; an alcohol, $C_{10}H_{18}O$, probably lævo-linalol; phenyl-ethyl alcohol, free or as ester; dextro-terpineol; phenyl-acetic and benzoic acids; and probably jasmone. A. Hesse and O. Zeitschel (*Journ. Prakt. Chem.* [2], **66**, 484) detect indol in small quantity in the oil, also acetic and palmitic acids, and a sesquiterpene alcohol, $C_{15}H_{26}$, nerolidol, b.p. 276–277°C., sp. gr. 0·880. It has but a faint odour. In addition to geraniol, an isomeric alcohol has been obtained, which the authors have named nerol; this does not form a solid calcium chloride compound, boils at a slightly lower boiling point than geraniol, 225–227°C., and gives a diphenyl urethane, melting at 73–75°C. The acetic esters of both nerol and geraniol are also present. Neryl acetate closely resembles geranyl acetate in odour. The oil extracted by solvents from *orange flower water* is found by Hesse and Zeitschel to contain phenyl-ethyl alcohol; phenyl acetic acid, methyl anthranilate, geraniol and nerol. It has the sp. gr. 0·915, the $[\alpha]_D = +2° \ 50'$, and the ester content is equivalent to 6 per cent. of linalyl acetate. Since the alcoholic constituents

and methyl anthranilate are relatively soluble in water, they are naturally found in greater quantity in the water-soluble oil.

The oil derived from *extract of orange blossoms* by steam distillation has a much higher ester value than neroli oil, this being equivalent to 41 per cent of linalyl acetate. It also contains 6·5 per cent. of methyl anthranilate. It has the sp. gr. 0·913; the $[\alpha]_D = -2°$. (Compare *Year-Book*, **1901**, 87; **1902**, 114–116 and 390.)

Nickel Salts for the Quantitative Determination of Reducing Sugars. Duyk. (*Comptes rend.*, **134**, 1163.) The substitution of an alkaline tartrate solution of nickel for the relatively unstable Fehling's reagent is advocated for the determination, by reduction, of glucose and other reducing sugars. The reagent, which is stated to be perfectly stable, is prepared by adding to 25 c.c. of a 20 per cent. solution of nickel sulphate, 25 c.c. of NaOH solution, sp. gr. 1·33, and 50 c.c. of an aqueous solution containing 3 Gm. of tartaric acid. It is used in precisely the same manner as Fehling's solution.

Nicotine, Estimation of in Tobacco. J. Toth. (*Chem. Zeit.*, **25**, 610, through *Analyst*, **27**, 12.) The sample is dried in the air or over quicklime, powdered, and 6 Gm. of it is weighed into a 200 or 300 c.c. porcelain basin. Here it is moistened and well rubbed down with 10 c.c. of 20 per cent. NaOH solution, and plaster of Paris is added by degrees till the whole forms a dry powdery mass. (This is better than adding plaster to only a paste-like consistency, as recommended by Neumann.) The powder is brought into a stout 25 × 5 cm. cylinder, where it is repeatedly agitated for an hour with 100 c.c. of a mixture of ether and petroleum spirit. 25 c.c. of the clear liquid is drawn off, run into a glass basin, treated with 40 or 50 c.c. of water and 1 drop of iodeosin solution; then an excess of decinormal acid is introduced, and the solution titrated back with alkali of equal strength. The results are accurate.

Experiments on the influence of ammonia on this process show (1) that the 25 c.c. of ethereal extract may contain 0·5 milligramme of ammonia as a maximum, but that the quantity is usually less; and (2) that if the sample contained ammonium salts, 98·5 per cent. of the corresponding ammonia would be retained in the gypsum. The method proposed by Keller for removing ammonia from the ethereal solution by a current of air is not trustworthy,

since the loss in alkalinity of the liquid and the alkaline vapours in the escaping air are due to slight volatilization of nicotine itself. Moreover, in Keller's process nicotine is retained by the aqueous liquid when this is extracted with the mixed solvents.

Nitrogen, Organic, Determination of, without Distillation or Gasometry. G. Denigès. (*Bull. de la Soc. de Pharm. de Bord.*, through *Journ. Pharm. Chim.* [6], **17**, 497.) The author shows that in most cases the distillation of the ammonia, before titration, as in Kjeldahl's method, is unnecessary. A solution of ammonium sulphate which contains nothing but an excess of H_2SO_4, or alkaline sulphates, may be exactly neutralized with alkali, using litmus or reazurin as an indicator. If to such a neutral solution a known volume of standard N/NaOH solution be then added, more than sufficient to displace the combined ammonia, and the mixture be boiled, the acid liberated from combination with the ammonia recombines with the excess of alkali, according to the familiar equation $(NH_4)_2SO_4 + 2NaOH = Na_2SO_4 + 2NH_3 + 2H_2O$.

It is then merely necessary to titrate the remaining uncombined NaOH, using phenol-phthalein as an indicator. The difference between this and the amount originally added is exactly equivalent to the ammonia formed. Thus 10 c.c. of urine was boiled with 5 c.c. of pure H_2SO_4 and 5 Gm. of $K_2C_2O_4$, until colourless; the cooled liquid was neutralized (with NaOH), using reazurin (or litmus) as the indicator, and diluted to 100 c.c. 50 c.c. of the neutralized liquid, treated as above with excess of N/NaOH solution, gave 12·7 Gm. nitrogen per litre of the original urine. 10 c.c. similarly treated with N/10 NaOH solution gave the same figure, which was confirmed exactly by a gasometric determination of the nitrogen. This method, in addition to being more convenient than the distillation process of Kjeldahl, has the advantage that it is available, if N/10 solution be used, for very minute amounts of nitrogenous matter.

Nux vomica, the Assay of the Liquid Extract of. F. H. Alcock. (*Pharm. Journ.* [4], **15**, 87.) Having experienced considerable difficulty in following the official instructions for the assay of the fluid extract of nux vomica, on account of the inseparable emulsion formed by the chloroform employed to shake out the liberated alkaloids, the author suggests the following modification of the process: Evaporate 10 c.c. as directed (or better until all the alcohol has been expelled, then add enough water to measure 10 c.c.).

Dissolve in, or rather diffuse through, 10 c.c. of warm water, transfer to a separator, add 2·5 Gm. of anhydrous sodium carbonate, and then the chloroform; agitate until the solid has disappeared and set aside. There floats on the surface of the chloroform an insoluble substance, which, however, stays in the contraction of the separator above the stop-cock and enables the chloroformic solution to be removed quite clear in each of the three separations. The process, as officially directed for the separation of the alkaloids, may now be proceeded with. The combined alkaloidal residue should be weighed before proceeding with the separation of the strychnine, and if the filtrate from the ferrocyanide precipitate be rendered alkaline with ammonia and extracted with chloroform, some idea of the accuracy of the strychnine figures may be obtained.

It was found that the aqueous portion, after shaking out with $CHCl_3$, was of a dark reddish-brown colour, and clear, after the subsidence of the insoluble substance previously mentioned. It was rendered slightly acid, and as a precipitate appeared, this was filtered away; the acid solution did not possess bitterness, but gave a precipitate with Mayer's reagent. A little of the acid liquid was evaporated nearly to dryness, and solid potassium bichromate and strong sulphuric acid added, which gave an intense crimson colour, but not any strychnine reaction. Brucine was also apparently absent. Can there be a third alkaloid in this liquid preparation of nux vomica? The insoluble substance filtered from the alkaline liquid similarly treated gave similar but more pronounced reactions. Actual experiments with 10 c.c. of the official liquid extract gave 0·245 Gm. of total alkaloid, and of this 0·110 Gm. was brucine. The strychnine amounted, by calculation, to 0·135 Gm., and this was found to be very nearly the same as was obtained by direct experiment upon the precipitated strychnine ferrocyanide as directed by the B.P. process of assay.

Oil, Formation of in Almonds. C. Vallée. (*Journ. Pharm. Chim.* [6], **17**, 272.) The author has investigated the successive appearance, during ripening, of reducing sugars, saccharose, and fixed oil in almonds. The pericarp, which only contains traces of fixed oil, contains relatively constant quantities of reducing sugars and saccharose during the process of ripening. In the nucleus, however, the reducing sugars slowly diminish in proportion as either saccharose or oil increase. Saccharose increases until oil appears, then it gradually diminishes for a period, to be again in-

creased as the formation of oil becomes less active. Ripe almonds contain about 2·97 per cent. of saccharose, as shown by the invertin method of Bourquelot.

It would appear, therefore, that the formation of sugars in the pericarp, or their afflux thereto, is constant during the process of ripening, and that these carbohydrates accumulate in the nucleus, where they are converted into oil, but it is impossible to state which, the reducing sugars or the saccharose, are the immediate precursors of the oil.

Olives, Determination of the Oils in. J. Pouget. (*Moniteur Sci.*, **16**, 651, through *J.S.C.I.*, **21**, 1197.) A rapid approximation of the amount of oil in olives may be obtained in the following manner: 100 Gm. of olives is crushed in a mortar with an equal weight of anhydrous sodium sulphate and 50 Gm. of sand. The mass is allowed to stand for 20 minutes, after which it is treated with 200 c.c. of petroleum ether of known density (0·700) in a stoppered bottle, and agitated occasionally for 16 to 18 hours. The specific gravity of the liquid is then determined and the weight of oil found by reference to a table, of which the following is an abridgement :—

Increase in Density.	Weight of Oil in 00 c.c. of Solvent.	Increase in Density.	Weight of Oil in 100 c.c. of Solvent.
1	0·5 Gm.	26	10·9 Gm.
2	0·7 "	28	11·9 "
4	1·5 "	30	12·9 "
6	2·3 "	32	13·9 "
8	3·1 "	34	14·9 "
10	3·9 "	36	16·0 "
12	4·7 "	38	17·0 "
14	5·5 "	40	18·1 "
16	6·3 "	42	19·2 "
18	7·2 "	44	20·4 "
20	8·1 "	46	21·6 "
22	9·0 "	48	22·8 "
24	10·0 "	50	24·1 "

[This method is suggestive, and might in many instances find application in the determination of fats of known density.—Ed. *Year-Book.*]

Opium, Detection of in Preparations containing it, and the Analysis of "Paregoric." A. H. Allen and G. E. Scott-Smith. (*Analyst*, **27**, 350.) The following notes are directed

to the detection of opium in such preparations as paregoric and cough mixtures. If a measured quantity (25 c.c.) of paregoric be rendered distinctly alkaline with caustic soda, and evaporated to about 10 c.c., the alcohol and a portion of the camphor and oil of anise will be volatilized, and the amount of alcohol can be deduced with sufficient accuracy from the specific gravity of the distillate. On shaking the residual liquid with ether, the remaining camphor and oil of anise will be extracted. If the ether be separated, and the aqueous liquid acidulated with hydrochloric acid, benzoic acid will in some cases be precipitated; but whether it separates or remains in solution it can be dissolved out by agitating the acidified liquid with ether. On allowing the separated ethereal solution to evaporate spontaneously in a small beaker, the benzoic acid is obtained in a state fit to weigh; but a better and more rapid plan is to repeatedly agitate the ethereal liquid with water until the washings no longer redden litmus add a little more water and a few drops of phenol-phthalein solution, and titrate the liquid with caustic N/20 alkali (preferably baryta-water), which should be added until the aqueous layer acquires a pink colour, not destroyed by agitation with the ether. Each 1 c.c. of N/20 alkali required represents 0·0061 Gm. of benzoic acid. If 25 c.c. of the tincture has been employed, the number of milligrammes of benzoic acid found, multiplied by 0·35, gives the grains of benzoic acid per pint of the tincture. The meconic acid extracted, together with the benzoic acid, is too small in quantity to affect the result, but its presence may be detected and the amount roughly determined by separating the ethereal layer after the titration is complete, and destroying the pink colour of the aqueous liquid by a drop of dilute hydrochloric acid. On now adding a drop of ferric chloride solution the deep purplish-red coloration characteristic of meconic acid will be produced. Meconic acid is, however, extracted with difficulty and imperfectly by agitating its acidulated aqueous solution with ether. Amylic alcohol is a far better solvent.

The detection of meconic acid in the above manner of course proves the presence of opium in the tincture. When this information alone is sought the paregoric may be diluted in a test-tube with proof spirit till it is of a light yellow colour, and a drop or two of solution of ferric chloride then added. If opium be present, a more or less deep red colouration will be produced, owing to the formation of iron meconate. By comparing the depth of red colour with that given by a standard tincture a rough indication

of the proportion of opium present can be obtained; but the amount of meconic acid in opium is too variable to allow of much stress being placed on the result obtained. It sometimes happens that paregoric is coloured with cochineal, or contains a variety of tannin, in which case the colouration with ferric chloride becomes obscured. On cautiously adding hydrochloric acid, drop by drop, the colour produced by iron tannate is destroyed, while that due to the meconate persists till considerably more acid has been added.

Unmistakable confirmatory evidence of the presence of morphine in cough mixtures may be obtained by obtaining a microscopic preparation of its typical crystals in the following manner: A portion of the amylic alcohol alkaloidal extract is shaken out with a little dilute acetic acid, a few drops of the aqueous acetate solution are put in a watch glass or a celled microscope slide, covering it with another watch glass moistened with strong ammonia, and allowing to stand for half-an-hour. If morphine be present, the characteristic elongated prisms of the crystalline base will be detected on examining the liquid under the microscope.

Opuntia vulgaris, Mucilage of. V. Harlay. (*Journ. Pharm. Chim.* [6], **16**, 193.) The mucilage of the common cactus, *Opuntia vulgaris*, is composed chiefly of arabane and galactane. It does not resemble the pectins in its properties of coagulation and precipitation, but seems more closely allied to the sparingly soluble gums, which give viscous solutions. The viscosity of its solutions is greater than that of tragacanth. It has a variable dextro-rotation, according to the method of preparation, the mean figure being $[\alpha]_D + 35°$. By prolonged boiling it appears to undergo hydrolysis, and becomes soluble, with a marked decrease of its rotatory power.

Orange Flower Oil, Concrete. A. Hesse and O. Zeitschel. (*Journ. Prakt. Chem.*, **66**, 481.) By treating orange flowers with light petroleum ether and distilling off the volatile solvent 0·0806 per cent. of oil was obtained, which, as regards quality of perfume, more closely resembles the true odour of orange flowers than oils prepared by any other method. It is much richer in esters than the oil obtained by distillation, indicating that these are to a very large extent saponified in the latter oil distilled with steam.

Orange Flower Water, Essential Oil of. A. Hesse and O. Zeitschel. (*Journ. Prakt. Chem.*, **66**, 481.) 30 tons of orange flower water yielded 10 kilos. of oil on shaking out with petroleum ether. It is qualitatively almost identical with neroli

oil, but contains much more methyl anthranilate and free alcohols with less esters. (See *ante*, p. 124.)

Organic Gas, New, in the Atmosphere. H. Henriet. (*Comptes rend.*, **135**, 101.) The presence in the air of the vapour of a monosubstituted formiamide, having the formula $HCON<^{H}_{R}$ is considered probable, although what the base may be has not yet been determined. It has been observed that the amount of CO_2 obtained from atmospheric air by simple passage through an alkali, and by prolonged circulation through the same medium, differs greatly, and that much greater quantity results from the longer action, indicating that CO_2 is present in some combination in which it is not immediately absorbable by alkali. Further, when air, filtered through cotton wool, is distilled with pure water, the distillate reduces silver nitrate, and, if concentrated, reduces $HgCl_2$ to $HgCl$; it also reduces $KMnO_4$ in alkaline solution, and gold salts; in fact, it gives all the reactions for formic acid. With Nessler's reagent, the distillate does not give the yellow colour typical of ammonia, but a quite distinct greenish-yellow tint, which becomes evident on standing, and is developed much more quickly if the distillate be first warmed with a little caustic potash, or with HCl, indicating that the body which gives the reaction is not present in the free state in the water. The condensation water from 100 litres of air collected in the centre of Paris, when evaporated in the presence of HCl, then treated with KOH and shaken out with $CHCl_3$, gave a $CHCl_3$ residue which had the powerful odour characteristic of the carbylamines.

Peppermint Oil, a New Adulterant of. E. J. Parry. (*Chem. and Drugg.*, **62**, 998.) A specimen of Wayne County peppermint oil has been reported on as containing a heavy oil, having all the characters of sesquiterpene, probably the essential oil distilled from African copaiba, and possibly another body which has not been identified. At least 35 per cent. of adulterant was present: Sp. gr., 0·909; opt. rot., $-3° 10'$.

Peppermint Oil Adulterated with Triacetin. C. T. Bennett. (*Chem. and Drugg.*, **62**, 591.) A specimen of commercial American peppermint oil is reported on, which was adulterated with 15 per cent of triacetin. It had the following physical characters: Sp. gr. at 15°C., 0·964; opt. rot., $[\alpha] = -15°$; esters as menthyl acetate, 71·2 per cent.; esters after acetylization, 53·1 per cent.; refractive index at 20°C., 1·4581. Solubility in alcohol

70 per cent., 1 : 2, but on addition of more of the solvent, oily drops separated on standing. Acetylization decreased the apparent ester number. Comparative fractionation of the adulterated oil and pure Wayne County oil gave the following figures :—

Adulterated Oil.

Fractions.	Quantity.	Sp. Gr.	Opt. Rotation.	Ref. Index.
1	12½%	0·900	−15°	1·4645
2	12½%	0·902	−15°	1·4670
3	12½%	0·910	−14°	1·4650
4	12½%	0·920	−16°	1·4640
5	12½%	0·926	−20°	1·4640
6	12½%	0·938	−22°	1·4640
7	6 %	—	—	1·4640
Residue . .	19 %	1·147	—	1·4450

Pure Oil.

(Sp. gr., 0·911; Ref. Index, 1·4645.)

Fractions.	Quantity.	Sp. Gr.	Opt. Rotation.	Ref. Index.
1	12½%	0·898	−10°	1·4660
2	12½%	0·903	−14°	1·4635
3	12½%	0·907	−16°	1·4645
4	12½%	0·910	−20°	1·4640
5	12½%	0·912	−23°	1·4615
6	12½%	0·912	−23°	1·4615
7	12½%	0·915	−34°	1·4630
Residue . .	12½%	0·962	—	1·4790

It will be seen that in the case of the pure oil no portion had a sp. gr. of more than 0·962, while in the case of the abnormal oil the sp. grs. of fractions 4, 5 and 6 were distinctly higher than the corresponding fractions of the pure oil, the residue having a sp. gr. of 1·147, and a much lower refractive index than that of any normal constituent of peppermint oil.

By distilling a much larger quantity of the oil, about 15 per cent. of a heavy liquid was obtained, which was further separated into 6 fractions (pressure 22 mm.), the last 2 fractions (representing about 55 per cent.) boiling at a fairly constant temperature, and having almost identical characters. The details are here given :—

—	Temperature.	Quantity.	Sp. Gr.	Opt. Rotation.	Ref. Index.
1	Below 145°C.	10%	0·972	−13°	1·4540
2	„ 158°C.	10%	1·050	−9°	1·4482
3	„ 165°C.	10%	1·134	Practically nil.	1·4395
4	„ 165°C.	10%	1·155	„	1·4370
5	„ 170°C.	20%	1·161	„	1·4355
6	„ 170°C.	35%	1·166	„	1·4355

On saponifying the higher fractions, the nature of the adulterant was shown, the presence of both glycerol and acetic acid being established.

Peppermint Oil, Italian. C. E. Zay. (*Staz. Sper. Agrar. Ital.*, through *Chem. Centr.*, **1/1903**, 331.) Three samples of Piedmontese peppermint oil grown in 1901 had the following characters:—

No.	Sp. Gr.	Free Acid Number.	Saponification Number.	Ester Number.	Iodine Number.	Refraction Index at 16°C.	$[\alpha]_D$ 16.	Total Menthol.	Free Menthol.	Combined Menthol.
1	0·916	0·18	45·2	45·0	147·1	1·468	−2·55°	55·5	45·78	9·72
2	0·9171	0·76	30·0	29·2	125·2	1·467	−11·4°	58·6	51·5	7·10
3	0·9266	2·03	33·7	31·7	131·9	1·468	− 7·9°	45·0	38·99	6·01

Peppermint Plants, Influence of Sodium Nitrate on. E. Charabot and A. Hébert. (*Bull. Soc. Chim.* [3], **27**, 914.) By comparative experiments with plots of peppermint plants growing under similar conditions, but one dressed with sodium nitrate, the other under normal cultivation, it was found that the percentage of total organic matter in the plants manured with nitrate was increased. The amount of esters formed in these plants was much higher, amounting to an excess of over 6 per cent. of menthyl acetate more than that occurring in the oil derived from the plants grown under normal cultivation. At the same time the amounts of menthol and menthone are less in the nitrate-fed crops. The yield of oil, observed at different periods in the growth of the crops, shows only a small difference between the two methods of cultivation, the plants grown under normal conditions giving a trifle more oil when yielding most freely. Thus, on July 18, 1901, 4 rows of normally cultivated plants in flower-bud gave 0·1676 per cent. of oil. On July 24 normal plants in full flower gave 0·2036

per cent. of oil; nitrate cultivated plants, 0·2017 per cent. On August 20, when the plants had reached maturity, the normal plants gave 0·033 per cent., and the nitrate-fed plants 0·047 per cent. In September the partly withered normal plants gave 0·355 per cent., while the yield from the nitrate crop fell to 0·289 per cent. (Compare *Year-Book*, **1902**, 120.)

Petitgrain Oil, Occurrence of Nerol in. H. von Soden and O. Zeitschel. (*Berichte*, **36**, 265.) The alcohol nerol, which closely resembles geraniol, but has a fresher odour, and which has been isolated by Hesse and Zeitschel from neroli oil, occurs to the extent of 2 per cent. in petitgrain oil. It has not yet been obtained in a state of purity. When contaminated with 10–15 per cent. of geraniol it has the sp. gr. 0·880; b.p., 225–227°C., and is optically inactive. It gives an acetate resembling geranyl acetate in odour, having the sp. gr. 0·971; b.p. at 25 mm., 134°C. Neryl formate resembles geranyl formate in odour; sp. gr., 0·928; b.p. at 25 mm., 134°C. In Schimmel's *Report, April*, **1903**, 63, it is pointed out that the constants given for impure nerol so closely approach those of geraniol that, at present, the existence of the new alcohol, although probable, cannot be considered as proved. The diphenyl-urethane of the supposed new alcohol could not be obtained pure by recrystallization from alcohol. From petroleum ether crystals having the m.p. 73–75°C., attributed to it by Hesse and Zeitschel, were obtained. But these, on again recrystallizing from that solvent, showed the still higher m.p., 80–81°C., which is the m.p. of geranyl diphenyl urethane.

Petitgrain Oil, Paraguay, Constituents of. (*Schimmel's Report, Oct.*, **1902**, 68.) In addition to linayl acetate, limonene and geraniol, the presence of the following bodies in Paraguay petitgrain oil has been established: Furfural, lævo-pinene (?), lævo-camphene (?), dipentene, an alcohol, $C_{10}H_{18}O$, probably lævo-linalol; dextro-terpineol, and traces of a basic substance.

Phenacetin, Distinctive Test for. F. H. Alcock and W. Wilkins. (*Pharm. Journ.* [4], **15**, 258.) If 0·01 Gm. of phenacetin be strongly heated for a few minutes with 5 c.c. of pure sulphuric acid in a porcelain evaporating dish, a distinctive colour reaction is obtained, which by most observers has been called a shade of purple. On subsequently pouring the resulting liquid, when nearly cold, into much distilled water and filtering the solution, if necessary, then

adding an excess of solution of ammonium hydroxide, a very deep purple-coloured solution results, which, in order to be well seen, should be largely diluted with distilled water.

Filtration is only necessary if the warming with the acid has been carried a little too far, when, of course, some charring may be expected. There will always remain a sufficient quantity of the new compound, even after evaporation of the acid to half the original volume used, to give the reaction satisfactorily.

With phenazone the acid treatment yields a yellow-coloured liquid, which, on dilution with water, yields a coloured solution resembling in appearance one of an aqueous solution of neutral potassium chromate, and on subsequent treatment with ammonium hydrate in excess does not yield anything like the phenacetin reaction. When sulphonal and acetanilide are submitted to this test the results are also entirely different.

Phenols, Determination of, in Medicinal Preparations. E. Barral. (*Journ. Pharm. Chim.* [7], **17**, 98.) A quantity of the substance to be examined, equivalent to approximately 0·20–0·30 Gm. of phenols, is introduced into a distilling flask with 78 c.c. of distilled water and 2–3 c.c. of HCl. The flask is then attached to a condenser, and 40 or 50 c.c. of liquid distilled off. This first distillate is set aside, a second similar quantity of water is added to the residue in the flask, and a second distillation conducted. Two such distillations are generally sufficient to carry over all the phenols, but to ensure perfect extraction a third should be performed, and if this gives a precipitate with bromine water, a fourth may be necessary. If phenols of high molecular weight be present, these may solidify on the tube of the condenser. If so, the solid concretion must be washed down with a small jet of water. The distillates are then passed through a tared filter; the solid phenols thus collected are washed, dried over H_2SO_4, and weighed. This weight is recorded as P_I. The bulked filtrate is then treated with an excess of bromine water. After standing for 24 hours the bromo-phenols precipitated are collected, washed, dried over H_2SO_4, and weighed. The weight of bromo-phenols is noted as P_B. This consists of the soluble phenols P_S and bromine. Since 80 parts of Br replace 1 of H, the weight of soluble phenols is represented by the equation $P_S = B_B - Br + \frac{1}{80} Br = P_B - \frac{79}{80} Br$.

The bromine in the bromo-phenols is determined in the usual way as silver bromide, after heating them with lime.

The weight of total phenol is found by the equation $P = P_I + P_S = P_I + P_B - \frac{79}{80}$ Br.

When the phenol exists as an ester, this must be saponified with alcoholic potash, the alcohol removed by exposure, *in vacuo*, over H_2SO_4 previous to distillation, as described above.

Phosphorus, Solubility of. C. Stich. (*Pharm. Zeit.*, **48**, 343.) Phosphorus is soluble to the following extent in the liquids named, in percentages by weight : Almond oil, 1·25 : 100; oleic acid, 1·06 : 100; paraffin, 1·45 : 100; water, 0·0003 : 100; and acetic acid, 30 per cent., 0·105 : 100.

Pilocarpine, Helch's Reaction for, and Apomorphine. A. Wangerin. (*Pharm. Zeit.*, **47**, 739.) According to Helch (*infra*), pilocarpine may be identified by the violet colour-reaction given when a solution of that base is treated, in the presence of benzol, with solution of $K_2Cr_2O_7$ and H_2O_2. The coloured substance is dissolved in the benzol on shaking. Under like conditions, however, apomorphine gives a similar colour, following the addition of the $K_2Cr_2O_7$ solution, and without the action of the H_2O_2. The reaction may be modified in several ways. If 1 c.c. of a 1 per cent. solution of apomorphine hydrochloride be treated with a few drops of $K_2Cr_2O_7$ solution and shaken up with 10 c.c. of acetic ether, the ethereal layer is coloured violet; on now adding a few drops of $SnCl_2$ solution (pure, dry $SnCl_2$, 1, in HCl, 50) to the mixture, the violet colour is changed to green, to be reconverted to violet on adding more $K_2Cr_2O_7$. If benzol, carbon disulphide, or toluol be substituted for acetic ether, the green colour is not obtained with $SnCl_2$, and with chloroform it is blue. With amylic alcohol, the colour produced by $K_2Cr_2O_7$ is blue and not violet, and it is turned green by $SnCl_2$. With pilocarpine the colours produced by $K_2Cr_2O_7$ and H_2O_2 are invariably discharged by $SnCl_2$.

Pilocarpine Hydrochloride, New Reaction for. Hans Helch. (*Chem. Centr.*, **73**, 146.) 1 or 2 Cgm. of pilocarpine hydrochloride, dissolved in a little water, is treated with 1–2 c.c. of acid, H_2O_2. A layer of 2 c.c. benzol is poured on the mixture, and 1 drop of very dilute solution (3 Mgm. in 1 c.c.) of $K_2Cr_2O_7$ added. On shaking, the benzol is coloured permanently with a bright violet tint. $CHCl_3$ may be substituted for C_6H_6. No other alkaloids give the same reaction. Pyridine and quinoline salicylate give a fugitive violet, which disappears in 20 minutes. Antipyrine, migrainine and salipyrine

give a deep blue colour. If neutral H_2O_2 be employed, pilocarpine, pyridine and salipyrine all give a violet reaction. If the coloured benzol or chloroform layer be removed and shaken with acid water, the colour is discharged. It is restored, however, in the case of the other bases, on again adding a drop of the bichromate solution, but not so with pilocarpine, which does not reproduce the violet tint.

Pitch, White, Russian, Constituents of. A. Tschirch and F. Koritschoner. (*Archiv der Pharm.*, **240**, 561 and 708.) The product known in the vernacular as "belji var," or white pitch, at first supposed to be derived from *Abies pichta* or *Picea obovata*, but ultimately traced to *Abies sibirica*, is found to consist of the following constituents: An amorphous acid, beljiabieninic acid, $C_{13}H_{20}O_2$, removed from the ethereal solution of the resin by shaking out with ammonium carbonate. It frits at 108°C., turning brown, and melts at 113–115°C. Crystalline beljiabietinic acid, $C_{18}H_{30}O_2$, removed by sodium carbonate. It forms transparent, colourless leaflets or tablets, united together in bundles or stellate groups, with a few well-formed isolated tabular crystals. When thoroughly dry it melts between 153–154°C., if slowly heated; if quickly heated, at 160°C. It is optically inactive, and contains no methoxyl groups. It affords a crystalline calcium salt, but the silver and lead salts are precipitated as amorphous flocks. From the mother liquor, after crystallizing out beljiabietinic acid, two amorphous isomeric acids, α- and β-beljiabietinolic acids, were isolated, both having the formula $C_{16}H_{24}O_2$. They were separated by means of the different solubility of their lead salts in alcohol, that of α-beljiabietinolic acid being insoluble, and therefore precipitated, while lead β-beljiabietinolate was left in solution. Both form white, light powders, having a markedly acid reaction, and being optically inactive; they begin to sinter at 88°C. and melt at 96°C. All the above were soluble in NaOH solution. After the removal of the acids, indifferent beljoresene, $C_{21}H_{36}O$, remained in solution with an essential oil. The latter boiled between 158–165°C. and had the sp. gr. 0·863. When freshly distilled, it was pale yellow and fluid, but became darker coloured and resinified on keeping. The following is the percentage composition of white pitch: Beljiabieninic acid, 4–5 per cent; beljiabietinic acid, 2·5–3 per cent.; α- and β-beljiabietinolic acids together, 42–50 per cent.; essential oil, 20–30 per cent.; beljoresene, 15–18 per cent.

Platinum, Gold and Silver, Determination of in Dental Alloys. P. A. E. Richards. (*Analyst*, **27**, 265.) *Alloys containing Platinum and Silver only.* A small piece of the alloy (about 0·3 Gm.) is weighed, placed in a small flask, about 10 c.c. of strong pure sulphuric acid added, and the flask heated for about 15 minutes over a Bunsen burner until action ceases for a couple of minutes. The acid is allowed to cool thoroughly, and is then poured off into a beaker containing distilled water, the metal being again treated with strong sulphuric acid (about 5 c.c.). The flask and contents are again heated for 5 or 10 minutes, the acid poured off and added to the first quantity; owing to the great density of platinum this is effected without any difficulty. The metal is washed twice with water, the washings being added to the silver sulphate solution, and next with several quantities of water to free it from acid.

The platinum is then transferred to a crucible by filling the flask completely with water and inverting it over the crucible, in which there is also a little water, the metal thereby falling into the lower vessel without loss. The greater part of the water is decanted off, the metal dried in the air bath, and weighed.

The platinum at the end of the experiment is not disintegrated to powder as one would expect, but retains more or less its original shape, presenting, however, a blistered appearance.

Silver may be estimated in the acid filtrate, if desired, by the sulphocyanide method, or taken by difference. The metal may also be recovered in the following simple way: The diluted silver sulphate solution, rendered slightly alkaline with ammonia, is warmed with a little glucose, and the precipitated silver filtered out, washed and dried.

Alloys containing Gold, Platinum, and Silver. From 0·3–0·6 Gm. of the alloy is first treated as described above; the insoluble residue of Pt and Au is washed, dried, and weighed as a check on the figures obtained. The residue is then dissolved in nitro-hydrochloric acid, concentrated to a small bulk, and the platinum precipitated as ammonium-platinum chloride, the latter strongly heated and the metal weighed.

The gold in the filtrate from the ammonium-platinum chloride is thrown down by ferrous sulphate, washed, dried, and weighed. The silver in the sulphuric acid solution is titrated as before.

Alloys containing Gold, Platinum, Silver, and Tin. A weighed portion of the alloy filings is extracted with boiling sulphuric acid several times, as described before, silver and tin being

dissolved, whilst platinum and gold remained behind. The residue, well washed and dried, is weighed, the platinum and gold being afterwards separated and estimated as before. The silver is determined by titrating the sulphuric acid solution, and the tin calculated by difference.

Polysaccharides, Hydrolysis of, by Soluble Ferments. E. Bourquelot. (*Journ. Pharm. Chim.* [6], **16**, 578.) The authors have obtained, from the behaviour of gentianose towards dilute acids and ferments (*Year-Book*, **1901**, 66), results which throw considerable light on the action of these latter bodies on sugars of high molecular weight. Gentianose has been shown (*ibid.*) to be a hexotriose consisting of 1 molecule of fructose and 2 of dextrose. It is completely hydrolized by 3 per cent. H_2SO_4, but by a single ferment this complete hydrolysis is not obtainable. Two such bodies must be present, such as invertin and emulsin, to effect the complete splitting up of the complex sugar molecule. Thus, if invertin alone be employed, only partial hydrolysis into levulose, and 2 united molecules of dextrose, which form the sugar described as gentiobiose. But if emulsin be then added, this gentiobiose is split up into 2 molecules of dextrose, and hydrolysis is therefore complete. The same result is obtained if the two ferments are allowed to act simultaneously on gentianose. The fact that the ferment of *Aspergillus* is capable of bringing about the complete hydrolysis of gentianose points to the fact that this consists not of one, but of two, or more distinct ferments.

Although emulsin acts very rapidly on gentiobiose when that sugar has been isolated, it is practically without action on gentianose, so that the combination of gentiobiose with the molecule of fructrose which forms gentianose renders the final compound immune to the influence of invertin.

Pseudocymopterus anisatus, Essential Oil of. J. W. Brandel. (*Pharm. Review*, **20**, 213, through *Schimmel's Report, Oct.*, **1902**, 73.) The essential oil of *Pseudocymopterus anisatus*, which grows in the Western United States, has an odour strongly resembling that of anise; its sp. gr. is 0·978 at 20°C., yet it does not solidify on cooling. This is probably due to the presence of methyl chavicol.

Pyramidon (dimethyl amido-dimethyloxy-quinzine), Distinctive Reaction for. G. Rodillon. (*Journ. Pharm. Chim.* [7], **174**, 172.) Pyramidon gives a blue colour reaction when treated with

any oxidizing agent such as hydrogen peroxide, alkaline hypochlorites or metallic peroxides. Excess of the reagent should be avoided, or the blue colour will be destroyed. Where hydrogen peroxide is employed, a gentle heat from 60-70°C. is necessary to develop the colour, but the hypochlorites react in the cold. Pyramidon also gives a very intense violet colour with ferric chloride solution, resembling the phenol reaction.

Pyrophosphorous Acid. V. Auger. (*Comptes rend.*, **136**, 814.) Pyrophosphorous acid, $H_4P_2O_5$, has been obtained in the form of colourless needles, m.p. 38°C., by treating the oily liquid resulting from the action of water on PCl_3, with more PCl_3 carried through it in the form of vapour, in a current of CO_2 for 20 hours. The clear syrupy liquid thus obtained gives, when exposed in a desiccator over CaO and recently fused P_2O_5, a crystalline mass of $H_4P_2O_5$. It is also obtained more expeditiously in 5 hours by submitting a mixture of H_3PO_3, with excess of PCl_3, to constant mechanical agitation. $H_4P_2O_5$ is very hygroscopic, and is at once hydrolized, on contact with water, into phosphorous acid.

Quinine and Quinidine, New Reaction for. E. Hirschsohn. (*Pharm. Centr.*, **43**, 367.) A solution of a neutral salt of either of these bases gives, on the addition of 1 drop of a 2 per cent. H_2O_2 solution, and of 10 per cent. $CuSO_4$ reagent, and heating, a raspberry-red colour, changing to blue violet, blue, and after a time to green. Other bases give colours, but none of the characteristic reddish violet tint which is evident with a dilution of 1 : 10,000.

Quinine, Detection of in Organic Secretions by Means of its Fluorescence. G. Denigès. (*Journ. Pharm. Chim.* [6], **17**, 505.) It is found that by observing solutions of quinine by means of the light produced with burning magnesium ribbon, the fluorescence of extreme dilutions is so evident as to afford an extremely delicate test for the presence of the base. The method has been applied to detect the alkaloid in urine, blood, milk, saliva, and bile. 10 c.c. of urine is treated with 10 drops of AmOH, and shaken out with 15 c.c. of ether. After separation, care being taken not to form an emulsion, the ethereal layer is removed, filtered, and again shaken out with 1 c.c. of 5 per cent. H_2SO_4 in a test tube, which is then illuminated with a piece of ignited magnesium ribbon, placed 6 or 8 Cm. before the lower part of the tube, care being taken to interpose a screen between the light and the eye. The fluorescence produced by the presence of 0·5 Mgm. of quinine per litre is thus rendered distinctly evident. Saliva is treated in a similar

manner, but more ether is used for shaking out, on account of the emulsifying properties of the solution. Normal bile, similarly treated, gives a fluorescent reaction in ethereal solution, even when not rendered alkaline; but this body is not extracted on shaking out with acid, so that if only the ethereal layer shows a fluorescence, and none is observed in the aqueous portion, it may be concluded that no quinine is present. Blood is first treated with oxalic or hydrofluoric acid, then treated with 10-15 c.c. of a 5 per cent. solution of sodium metaphosphate and 3-5 c.c. of sulphuric acid 5 per cent., sufficient water being added to bring the volume of the mixture to 20 or 25 c.c. After mixing, the solution is heated on the water bath and filtered. The filtrate is rendered alkaline with AmOH, shaken out with ether, then treated as described, under urine. Milk is treated with 10 c.c. of the metaphosphate solution and 10 c.c. of water, for every 20 c.c. of milk taken, and heated to boiling; 2 c.c. of 5 per cent. H_2SO_4 is then added and the boiling repeated. The coagulum is filtered out, and 10 c.c. of the filtrate treated with ammonia and ether as described above. Viscera and anatomical preparations are first extracted with 1 per cent. H_2SO_4, then treated as recommended for urine.

[Probably by employing dilute H_3PO_4 for the final shaking out, instead of H_2SO_4, the delicacy of the test would be enhanced, seeing the intensity of fluorescence of quinine in solution in excess of H_3PO_4.—ED. *Year-Book.*]

Radium, the Properties of. (*Pharm. Journ.* [4], **16**, 472.) In a paper before the Royal Society, W. J. Crookes describes the results of experiments with radium. Radium, an element akin to uranium, is an astonishing example of radiant matter. Brought near a screen of sympathetic structure and material—Sidot's hexagonal blende (zinc sulphide) is used—it causes phosphorescence in the screen, which increases and diminishes as the screen is brought nearer or withdrawn farther away. It is so energetic that anything which has been in contact with it—glass vessels, platinum wire, or the human finger—becomes radio-active, and will cause phosphorescence in the blende screen. If the minutest particle of radium or its nitrate fall upon the screen, it becomes a brilliant speck of green light; and when these little specks of phosphorescent light are examined beneath a microscope their appearance is changed to a meteor-shower of minute sparks. Also, when a piece of radium is brought close to the screen, and the phosphorescence is examined under the microscope, the surface of

the screen is seen to be sparkling with innumerable bright scintillations, twinkling in and out like stars upon a black sky. These scintillations, it is reasonable to suppose, are due to the bombardment of ions, each of which, as it is hurled on the screen, causes by its disturbance of the ether, a luminous splash large enough to be visible under the microscope. Yet, despite the ceaselessness of the emissions, the mass of the radiating body appears to suffer no diminution. A still more remarkable communication on the subject has been made by Curie to the French Academy of Sciences. He states that radium possesses the property of continuously emitting heat without combustion, without chemical change, and without any change in its molecular structure, which remains spectroscopically identical after many months of continuous emission of heat. Further, radium is said to maintain its own temperature at a point 1·5° C. above its surroundings. Apparently the substance has the power to gather up and convert into heat some form of ambient energy with which we are not yet acquainted. W. J. Crookes revives the hypothesis which he submitted to the British Association five years ago. He then suggested that the atomic structure of radio-active bodies was such as to enable them to throw off the slow-moving molecules of the air with little exchange of energy, while the quick-moving missiles would be arrested with their energy reduced and that of the target correspondingly increased. The energy thus gained by the radio-active body would raise its temperature, while the surrounding air would get cooler. This energy, again, would be employed, partly in dissociating some of the gaseous molecules and, partly, in originating undulations through the ether.

Radium. P. Curie. (*Pharm. Journ.* [4], **16**, 886.) In the course of a lecture at the Royal Institution, its discoverer showed that radium and its salts have the power of spontaneously and continuously disengaging heat, as may be shown by experiments with a thermometer or a calorimeter. It is able to provoke luminous phenomena in such substances as barium platinocyanide, its power persisting even when plunged inside a vessel of liquid air. Its electrical effects may be strikingly demonstrated, since, under the influence of radium, air becomes a good conductor of electricity. The leaves of a gold leaf electroscope charged with negative electricity at once collapse when a minute quantity of radium is brought into its vicinity. If a current from an induction coil be made to spark across two gaps, and radium be brought

near to one, the spark ceases to pass across the other gap. The emanations may be classified into three groups, and may, for convenience, be termed the α, β, and γ rays. The α rays are the most easily absorbed by other bodies exposed to their influence; the β rays are those concerned more closely with the electrical and magnetic effects, and the γ rays are to a great extent analogous to the Röntgen rays. Numerous substances become possessed of radio-activity under the influence of radium and its salts in solution, and all phosphorescent substances become strongly luminous. A use may be found in ophthalmics for the substance, as the human eye becomes luminous with a peculiar livid colour. The emanation behaves in many ways like a gas; it can be aspirated through a tube, can be condensed by liquid air, and after being frozen out of a vessel will diffuse through it again when the temperature is allowed to rise. The apparently eternal faculty of giving out heat energy may be shown by an experiment with an apparatus which is, in fact, a liquid air calorimeter. A small piece of glass is lowered into a carefully isolated vacuum flask containing liquid air, the latter being immersed in a bath of similar nature, to minimize the effect of outside interference. The volume of gas given off in a certain time is carefully measured in a eudiometer. On repeating the experiment with a small vessel, identical in size with the piece of glass, but containing radium bromide, the volume of gas collected in the same time is much larger. The physiological effects of radium on the skin are strongly marked and disagreeable. In five minutes the skin becomes inflamed, while paralysis of the brain, and even death, may result from an application of the substance for any considerable period to the head. The colour effects are also deserving of mention: Glass is coloured permanently violet, sodium chloride blue; indeed, most chemical substances are coloured by its action. Radium rays will convert yellow phosphorus into the red variety, and mercuric chloride into calomel. Ignited in a Bunsen burner, a bright red colour, similar to that caused by strontium salts, is imparted to the flame. The spectrum shows that the substance is really an element. The story of its discovery, which is principally due to Mdme. Curie, is intimately connected with that of other radio-active bodies, such as polonium, thorium, and the most recent discovery, actinium. Only 0·2 Gm. of radium is contained in a ton of pitchblende. Very minute quantities of radium may be detected by the electroscope when the spectroscope gives no certain indication of its presence. The nature of the body and the

cause of its unique properties can only be matters of theory or conjecture. Crookes' theories as to the evolution of matter seem to be acceptable.

Radium, Summarized History of. C. W. Kanolt. (*Scientif. Amer.*, **88**, 199.) In 1896 H. Becquerel discovered the radio-activity of uranium. He found that all compounds of uranium, as well as the metal itself, continually emit radiations, which act upon photographic plates and have a penetrating power similar to that of the X-rays. This was one of the first of a series of quite remarkable discoveries. Of the elements already known, thorium as well as uranium was found to be radio-active. But research has led to the discovery of three new radio-active substances, which are looked upon as new elements. These are radium, polonium, and actinium. Of these radium alone has been obtained in a pure condition, and it is the one which has been most experimented with.

Curie and Mdme. Curie turned their attention to pitchblende, a mineral which consists largely of oxides of uranium. They found that some samples of this mineral from Bohemia possessed a greater activity than either uranium or thorium, the only substances then known to be radio-active. This fact led them to the conclusion that the activity of the pitchblende must be due to some new element of great activity. In order to find this new substance, they dissolved a quantity of pitchblende in acids and, by the ordinary chemical methods, separated the material into portions containing different elements. They then observed which of these portions possessed radio-activity. This could be done by exposing photographic plates wrapped in opaque paper to the substances and observing which plates were acted upon. But it could be done more expediently by another method. Becquerel had observed that the new radiations—"Becquerel rays" as they are now called—render the air through which they pass a conductor of electricity. They are now known to have a similar effect upon many other substances which do not ordinarily conduct electricity. The Curies had but to measure the conducting power of the air in the immediate neighbourhood of the material under investigation, to find whether the material was radio-active and to obtain a measure of its activity, if it possessed any. Guided by such experiments, they gradually concentrated the active substances into small portions of the material. One portion they believed to contain a new element, which they called "polonium"; another yielded radium.

Radium greatly resembled barium chemically, and its separation from barium was the last and most difficult part of the operation. It was at length accomplished by fractional crystallizations and precipitations, and in 1902 Mdme. Curie announced the preparation of pure radium chloride. E. Darmaçay examined the spectrum of this material, and found that it consisted of lines which were not those of any previously known element, thus proving quite conclusively that the radium was actually a new element.

According to Curie, there are not two pounds of radium in existence. In the last three years not more than one and one quarter pounds have been manufactured. Even this small quantity is of all grades of purity. Absolutely pure radium does not exist as a metal. Only its salts are known. The substance with which chemists experiment is radium chloride associated with barium. Of the value of radium many fantastic accounts have been given. Curie has what is probably the only pure specimen of chemically pure radium in the world. The sample is about the size of a buckshot, and weighs not quite half a grain. So many tons of pitchblende were required for the reproduction of this small amount that Curie has said it could not be bought for £4,000; indeed, such a specimen of radium has almost any commercial value its possessor chooses to give to it. A firm of manufacturing chemists of Paris furnish tiny tubes of radium of a lower grade, containing an appreciable quantity of barium, and weighing about as much as Curie's precious specimen, for £1,000. Preparations containing barium salts and small quantities of radium are on the market at much lower prices.

The amount of radium contained in pitchblende is so small that it must be brought to a concentration no less than five thousand times as great before it can be detected by that exceedingly delicate instrument, the spectroscope. It is needless to say that the discovery of some mineral yielding radium in greater quantities is much to be desired. Crookes, reasoning from the facts that radium is very similar chemically to barium, and that elements of similar nature are likely to be associated in minerals, experimented with a number of specimens of barium minerals with the hope of finding radium in them; but none of them were radio-active.

The radio-activity of the pure salts is very great. Curie states that it is a million times as great as that of uranium. The radium rays will act upon a photographic plate in a few seconds, while uranium requires hours.

The radiations themselves are very interesting. They cannot be refracted, polarized, or regularly reflected, as ordinary light can be. They are quite different from light. Becquerel observed that a part of them are deflected by a magnet. This immediately reminds one of the cathode rays of a Crookes tube, which are similarly deflected. The cathode rays are now known to be nothing less than streams of most minute particles, carrying negative electricity and moving with enormous velocities. All evidence points to the deflectable portion of the Becquerel rays being the same. The Curies have shown that they also carry negative electricity; and Becquerel that, like the cathode rays, they are deflected by electrostatic forces. From the results of these experiments, Becquerel has calculated the velocity of these particles. They do not all move at quite the same rate. A portion of them have a velocity of 100,000 miles per second, a velocity quite comparable with that of light. The cathode rays in a Crookes tube have a velocity of about two-thirds that of light.

Becquerel has also calculated the ratio of the mass of the particles to the quantity of electricity which they carry, and this, too, has about the same value as in the case of the cathode rays. J. J. Thomson has shown that the particles in a Crookes tube have a mass only about one-thousandth of that of a hydrogen atom, which we have always looked upon as the smallest particle of matter existing. We have reason to believe that the particles of the Becquerel rays are of the same size.

One might reasonably inquire whether radium does not rapidly lose weight as the result of the constant emission of these particles; but Becquerel has calculated that one square centimetre of radium surface would lose only 1·2 Mgm. of matter in a thousand million years. However, A. Heydweiller has recently found that radium does lose weight perceptibly. He found that 5 Gm. of a material containing a small percentage of radium lost about 0·02 Mgm. per day, and he observed a total loss of about 0·5 Mgm.

The portion of the Becquerel rays which are not deflected by a magnet appear to consist largely of very penetrating rays resembling the X-rays; but there are also rays of a third kind, easily absorbed.

One of the most striking properties of radium is its luminosity. Pure radium chloride emits enough light to enable one to distinguish printed characters. The rays from radium excite phosphorescence in many bodies, such as zinc sulphide, diamond,

and even common salt. The luminosity of radium is perhaps but the phosphorescence produced by its own rays. If a small quantity of radium is held against the forehead while the eyes are closed, one will see light. The rays penetrate to the retina, and cause it to phosphoresce.

Certain chemical changes are brought about by the rays from radium. Under their influence, oxygen is converted into ozone, yellow phosphorus into red phosphorus; glass becomes violet and almost black.

The physiological action of the rays is quite marked. If a small quantity of radium be kept near the skin for a few hours, the rays produce a serious sore. Becquerel once slipped a small quantity of radium contained in a glass tube into his vest pocket. He carried it in all about six hours. For some days no result was observed, but at length a sore developed, which required seven weeks to heal. The hands of persons working with radium are likely to be affected. The fingers become inflamed and very painful. Curie has said that he would not venture into a room containing one kilogramme of radium, as it would probably destroy his eyesight, burn off his skin, and even kill him.

E. Aschkinass and W. Caspari have exposed cultures of *Micrococcus prodigiosus* to the rays from radium, with the result that the bacteria were killed. It was necessary to place the radium quite near to the bacteria, as the action seemed to be due to those of the rays, which are easily absorbed by the air.

When any body is placed near to a radium salt exposed to the air, it becomes radio-active itself. This induced activity is only temporary, however. It disappears in the course of a few hours or days. It does not depend upon the nature of the body in which it is induced. Even the hands and clothing of the experimenter become temporarily active. The induced activity seems to be produced not by the radiations, but by a radio-active "emanation" or gas-like substance which is given off by radium and carried by the air. Exactly what this emanation is, is not known; but Rutherford and Miss Brookes have made a determination of its rate of diffusion, which indicates that its molecular weight lies between 40 and 100. F. Giese states that a solution of radium bromide decomposes to some extent, with the liberation of bromine and the formation of radium hydroxide and other compounds; and that it also liberates a peculiar colourless gas which is radio-active. What this gas is has not yet been made known. It may be mentioned that Rutherford and Soddy have found that the

emanation which is given off by thorium compounds has the chemical inertness of the gases of the argon group.

The energy of the rays from radium has been found to be quite considerable. Rutherford and McClung have estimated that a Gm. of radium radiates in a year energy equivalent to 3,000 Gm. calories, which is about one foot-pound per hour, that is, the power necessary to raise a pound a foot in an hour. The source of this energy is a mystery. Several theories have been presented to account for it. Rutherford and McClung suggest that the energy is liberated by the breaking down of the atoms into smaller particles, the particles that are radiated.

Rattle-snake Oil, Characters of. L. F. Kebler and G. R. Pancoast. (*Proc. Amer. Pharm. Assoc.*, **50**, 365.) A specimen of genuine rattle-snake oil had the following characters: Sp. gr. at 15°C., 0·9217; acid number, 3·57; saponification number, 210·9; iodine number, 105·58.

Rhubarb, Essential Oil of. (*Haensel's Quarterly Report, July*, **1902**, 20.) The comminuted roots of *Rheum rhaponticum* yielded to steam distillation, 0·0041 per cent. of a concrete oil, of an intense yellow colour, possessing in a marked degree the characteristic aromatic odour and taste of the root. It melts at 25·5°C. Chrysophanic acid was found to be present in the oil, and was probably accompanied by emodin.

Rimu Resin. T. H. Easterfield and C. B. Aston. (*Proc. Chem. Soc.*, **19**, 191.) The Rimu, *Dacridium cupressinum*, N.O. Coniferæ, is one of the most valuable of the New Zealand timber trees, the cracks and fissures in the wood of which are almost always filled with a hard, pink resin with a distinctly crystalline fracture. The chief constituent of this, comprising 75 per cent. of the resin, is rimuic acid, $C_{16}H_{20}O_3$, which is crystalline, m.p. 192–193°C. It distils, with very slight decomposition, at 296–300°C., under 21 mm. pressure, and is lævo-rotatory $[\alpha]_D - 159°$. The barium salt crystallizes in well-formed square plates, having the composition $Ba(C_{16}H_{19}O_3)_2 14H_2O$. The alkaline salts are very soluble, and do not crystallize in the presence of excess of alkali. It yields benzoyl and acetyl derivatives, and its formula may be written, $C_{15}H_{18}(OH).COOH$.

Rosemary Oil, Commercial. E. Dowzard. (*Chem. and Drugg.*, **61**, 520.). The maximum sp. gr. and rotation allowed by the B.P.

for this oil are too low, as a few genuine oils are occasionally met with which give figures outside the B.P. limits, e.g.:—

	Sp. Gr.	Rotation (100 mm).
B.P.	0·900–0·915	Not more than +10°
No. 1	0·915	+11°
No. 2	0·917	+ 9°
No. 8	0·917	+10° 20′

According to Parry, the limits 0·900–0·918 may be regarded as covering all genuine oils, which should be detro-rotatory from +1°–+12°.

Rosin Oil, Detection of in Mineral Oils. G. Halphen. (*Annales de Chim. Analyt.*, **8**, 9.) A single drop of the oil to be tested is placed in a small porcelain capsule; about 2 c.c. of a solution of 1 volume of pure crystallizable phenol in 2 volumes of carbon tetrachloride are then added and the mixture stirred to effect the complete solution of the oil. A rotatory movement is then imparted to the liquid so as to moisten evenly the sides of the capsule over its whole surface. A vessel containing a solution of 1 part of bromine in 4 parts of carbon tetrachloride is then inclined over the capsule in such a manner that the vapour only, and not the liquid itself, comes in contact with the oily surface. As the bromine reacts on the oily mixture, characteristic colours are developed in 5–10 seconds. With rosin oil the tint is intense violet; with mineral oil no reaction, or a greyish or brownish red results. Not only is the test serviceable to detect the presence of less than 10 per cent. of rosin oil mixed with mineral oil, but it also serves to distinguish other animal and vegetable oils, *inter se*, by the characteristic colour reactions it affords. A complete list of these is given.

Rubidium-Ammonium, and Cæsium-Ammonium. H. Moissan. (*Comptes rend.*, **136**, 1177.) *Cæsium-ammonium* is formed by the action of ammonia on cæsium at 40°C. The manipulation is delicate, since cæsium takes fire immediately on contact with the air; it has therefore to be handled in an atmosphere of hydrogen or of CO_2. On cooling the tube with a mixture of acetone and CO_2, a quantity of a blue liquid with a reddish brown reflection is formed, from which cæsium-ammonium ultimately separates. The colour of cæsium-ammonium is brassy, and is not so dark as that of sodium-ammonium of lithium-ammonium. It is crystalline. On contact with the air each particle takes fire and burns with a bright

flame; it is very soluble in liquefied ammonia, with which it gives a blue solution of an oily consistence, with a dark brown reflection. On heating this, or exposing it to a vacuum, dissociation takes place, metallic cæsium being deposited in small, brilliant crystals, which are scattered over the tube. Analysis confirms the theoretical formula NH_3Cs.

Rubidium-ammonium, NH_3Rb, is more easily obtained, since rubidium is easier to handle. It resembles the cæsium compound in general properties; on dissociation the rubidium is left as a silvery white crystalline mass, composed of small, very brilliant prisms.

Rubidium and Cæsium Hydrides. H. Moissan. (*Comptes rend.*, **136**, 587.) By passing a current of hydrogen over rubidium in a horizontal tube, the lower part of which alone is heated to 300°C., the upper part being less heated, an abundant crystalline sublimate of rubidium hydride is obtained. Cæsium hydride is obtained in a similar manner, but metallic cæsium is less easy to handle, since it immediately takes fire when free from the protecting naphtha. It is less volatile than rubidium hydride, and forms a thick layer of crystals in the upper part of the boat which has contained the metal.

Rubidium hydride occurs in acicular colourless prisms. Cæsium hydride forms flatter, very brilliant crystals. Rubidium hydride has the sp. gr. about 2·0; cæsium hydride that of 2·7. Both hydrides are dissociated below 300°C. They take fire on contact with fluorine, evolving a vivid flame. They also inflame in cold chlorine, and when the action is incomplete, rubidium forms a green subchloride, cæsium an orange-yellow residue. With bromine both behave as with chlorine. With iodine, a slight heat is necessary to start combination, which then takes place—in the case of cæsium hydride, with incandescence. Both hydrides ignite on contact with melted sulphur. They also ignite in oxygen at ordinary temperatures with such violence that the containing tube is often shattered. They take fire in atmospheric air. Heated in a current of nitrogen, they form a mixture of nitride and amide of the respective metals, which is decomposed by water with the evolution of ammonia. In this they differ from the hydrides of potassium, sodium and calcium. They give phosphides when treated with liquid phosphorus, and arsenides with arsenium; cæsium arsenide is of a fine red colour.

Both are decomposed by water, according to the equation RbH +

$H_2O = RbOH + H_2$. Neither hydride is attacked by CO_2 in the cold, but on warming, combination to a formate takes place. A rapid current of SO_2 causes a bright incandescence with these hydrides, with formation of sulphites and sulphates. If elevation of temperature be avoided, a hyposulphite is also formed. In a current of gaseous ammonia, or on contact with liquid ammonia, the hydrides are transformed into amides according to the equation $RbH + NH_3 = NH_2Rb + H_2$. Analysis establishes the formula of rubidium hydride as RbH, and of cæsium hydride as CsH.

Rubrescine, a New Indicator. A. Rosenfeld. (*Journ. Pharm. de Liège*, through *Bull. Comm.*, **30**, 386.) Rubrescine is obtained by the action of chloral hydrate on resorcin. It is soluble in water and in ethyl or methyl alcohol, giving a deep red solution. It is very sensitive towards alkalies, with which it gives a deep red colour, also with borax, alkaline carbonates, and ammonia. The end reaction is very sharp. In the presence of the slightest trace of acid the red colour is discharged, being replaced by a yellow tint.

Rue Oil, Constituents of. F. B. Power and F. H. Lees. (*Proc. Chem. Soc.*, **18**, 192.) A rue oil, sold as "Ol Rutæ Ang.," but subsequently ascertained not to have been distilled from English-grown rue, had the following characters: Sp. gr., 0·8405; $[\alpha]_D - 3° 48'$; solubility in alcohol 70 per cent., 1 : 2. It contained the following constituents: Methyl *n*-heptyl ketone; methyl *n*-nonyl ketone; methyl *n*-heptyl carbinol; methyl *n*-nonyl carbinol; a blue oil of high, but not constant b.p.; acetic acid; a basic substance with the odour of quinoline; a mixture of free fatty acids; methyl salicylate; a valerianic ester, probably ethyl valerianate; pinene; lævo-limonene; and cineol. Methyl heptyl and nonyl ketones comprised each about 40 per cent. of the oil. From the nature of its constituents, it was probably derived from Algerian plants.

Salicin, Location of in the Bark of Salix purpurea. O. Brown. (*Pharm. Journ.*, **16**, 588.) An authentic specimen of the air-dried bark of *Salix purpurea* was found to contain salicin in the following proportions: The whole bark contained 5·8 per cent.; the inner bark 11·3 per cent.; the middle bark 8·0 per cent.; the outer bark 2·5 per cent. of salicin.

It appears, therefore, that while salicin exists in all parts of the bark, it is found in largest quantity in the inner, next in the middle, and only in comparatively small quantity in the outer bark.

Samples of bark taken from the same tree in the spring, and in the autumn following, were found to contain the following. quantities of salicin: Spring, = 7·38 per cent.; autumn, = 6·66 per cent.

Salicin, Note on Production of. T. Fawssett. (*Pharm. Journ.* [4], **16**, 784.) The remunerative production of the glucoside on a commercial scale would appear to depend on the following conditions, viz.: (1) The use of the right kind of willow bark; (2) The purchase of the peelings as a by-product of basket manufacture; (3) The employment of a good process of extraction; (4) The working of the bark soon after it is stripped from the twigs.

With regard to point (1), there seems no doubt that the best kind of peelings for the manufacture of salicin are those known in Belgium as "rood schors," but as to their botanical origin some uncertainty appears to exist, since Brown says they are produced by *Salix fragilis;* while Crispo considers the source to be *Salix purpurea.*

It is evident that if the peelings are obtained as refuse from a basket manufactory, the price will be low, and with a view of reducing the cost of production to its lowest point, the salicin makers, both Continental and British, have apparently recently formed themselves into a syndicate which will absolutely control the article.

They have established a factory in the heart of the willow-growing country, where it is proposed that the peelings shall be boiled down and distributed to the members of the syndicate, either in the form of the concentrated fluid extract from which the salicin is obtained, or as crude salicin itself. By this means the heavy carriage which was formerly incurred in sending the bulky peelings from Belgium to other countries will be avoided. Another advantage will be that the bark will be worked in as fresh a state as may be desired.

With regard to the process actually employed, it is, of course, a trade secret; but as the result of experiments made, a method of manufacture which would yield good results might be worked out from the following:—

Macerate "rood schor" willow peelings in water for some hours at a temperature as much below the boiling point as will exhaust them. Strain and remove all moisture from the marc by hydraulic pressure. Evaporate the fluid extract thus formed to a low bulk (*in vacuo*). Throw out the tannin and extractive by treating

the liquid in succession with lime, lead acetate, and basic lead acetate. Remove excess of any of these precipitants with oxalic acid. Filter and evaporate the clear solution to crystals.

It has been stated that lead acetate alone will purify willow bark decoction of its tannin, but the author has failed to verify this. After various trials, success was only attained by the use, in succession, of lime, lead acetate, and lead subacetate. Sometimes a final purification with animal charcoal was necessary.

Salicylic Acid, Determination of. Sidney Harvey. (*Analyst*, **28**, 2.) An aqueous 1 per cent. solution of iron-alum, to which a few drops of H_2SO_4 have been added as a preservative, is recommended for the colorimetric determination of salicylic acid. The tint given by this reagent is more definite and persistent than that obtained with Fe_2Cl_6. The acid is extracted from a known volume of the previously acidified solution by two successive shakings out with ether. The bulked ether extracts are then shaken out with N/2 or N/10 alkali, the alkaline solution exactly neutralized with acid and diluted to a definite volume of 250 or 500 c.c. 100 c.c. of this solution is treated, in a Nessler glass, with 2 c.c. of the iron-alum reagent, and the colour matched with a known volume of freshly prepared standard solution of salicylic acid containing 0·001 Gm. or 0·0001 Gm. of salicylic in each c.c.

Salicylic Acid in Fruits. F. W. Traphagen and E. Burke. (*Journ. Amer. Chem. Soc.*, **25**, 242.) The authors not only confirm the statement of Portes and Desmoulières (*Year-Book*, **1902**, 144) as to the presence of salicylic acid in strawberries, but find that it is a natural constituent of many other fruits. They have isolated it from raspberries, blackberries, currants, plums, black cherries, apricots, peaches, grapes, crab apples, standard apples, and oranges, as well as from strawberries. Currants were found to contain 0·57 Mgm. of the acid in 1 kilo of fruit; cherries, 0·4 Mgm.; plums, 0·28 Mgm.; crab apples, 0·24 Mgm., and grapes, 0·32 Mgm. The fruit was distilled with H_3PO_4, the distillate shaken out with ether, and the ethereal residue tested with Fe_2Cl_6. This method, when tried with known quantities of salicylic acid, was found not to give the whole of the acid in the distillate. Consequently the amount actually present must be greater than indicated by the above figures. Tomatoes, cauliflowers, and scarlet runners were also found to contain salicylic acid.

Sambucus racemosa arborescens, Fixed Oil of the Fruit of. H. G. Byers and P. Hopkins. (*Journ. Amer. Chem. Soc.*, **24**, 771.) The bright, scarlet fruits of red elderberry, which grows in great quantity on the Cascade Mountains, and in the neighbourhood of Puget Sound, are not employed as food or for making wine, on account of their unpleasant odour, and the amount of oil they contain. The authors have examined this oil, obtained by expression; it is light yellow in colour, darkening on standing. It has the sp. gr. 0·9072; it congeals at −8°C., and melts at about 0°C. It contains palmitin, 22 per cent.; olein and linolein, 73·6; caprin, caproin and caprylin, 3·0 per cent., and unsaponifiable matter, 0·66 per cent. Its saponification number is 209·3; iodine number, 81·44; Hehner number, 91·75; Reichert-Meissl number, 1·5; free acid number, 6·65. It will be seen that most of these closely approximate those of olive oil.

Scopoline. E. Schmidt. (*Apoth. Zeit.*, **17**, 592, through *Chem. Centr.*, **1902** [2], 844.) Scopoline, $C_8H_{13}O_2N$, obtained by the action of Ba2HO on scopolamine, is practically unaltered by heating with HI, sp. gr. 1·7 to 150–160°C., but by increasing the strength of the acid to sp. gr. 1·9 and heating to about 150°C. in the presence of amorphous phosphorus, the greater part is converted into hydroiodoscopoline hydriodide, $C_8H_{14}O_2NI.HI$, which forms colourless crystals, m.p. 196°C. By prolonged heating to 190–200°C. with excess of HI and amorphous phosphorus, the base, $C_8H_{15}N$, having a strong narcotic odour, is obtained, which has been named *hydroscopolidine*. By heating scopoline with HBr to 130°C., *hydrobromscopoline*, $C_8H_{14}O_2NHBr$ is obtained in colourless columns of prismatic needles, m.p. 202°C. This body gives, on acetylizing, a diacetyl compound, the auro-chloride of which, $C_8H_{12}NBr(OCOCH_3)_2HCl.AuCl_3$, forms golden-yellow transparent tabular crystals, m.p. 187°C. Hydrobromscopoline, when reduced with zinc and H_2SO_4, gives a base which also forms a diacetyl compound, the gold salt of which, $C_8H_{13}N(OCOCH_3)_2HCl.AuCl_3$, crystallizes in scales, m.p. 185°C. The reduction product gives a dibenzyl-derivative, the gold salt of which, $C_8H_{13}N(OCOC_6H_5)_2$. $HCl.AuCl_3$, crystallizes from ether in opaque warty masses, m.p. 200–201°C. Hydroxylamine, phenylhydrazine, and semicarbazide have no action with scopoline. It is evident that although scopoline contains only one HO group, yet by the action of HBr it is converted into a base which is a dihydroxyl derivative. The second oxygen atom which in scopoline helps to form the ether or

morpholin group $O\left\langle\begin{matrix}C=\\C=\end{matrix}\right.$ is changed by HBr or HI into the hydroxyl group $\begin{matrix}HO.C=\\ |\\ BrC=\end{matrix}$

Skatol in an African Wood. (*Schimmel's Report, April*, **1903**, 79.) Skatol has been isolated from a red brown wood from Amani in German East Africa, the botanical source of which has not been determined. It will be remembered that the same body was found by W. R. Dunstan in the wood of *Celtis reticulosa* (*Year-Book*, **1889**, 38).

Skunk Oil, Authentic, Characters of. Lyman F. Kebler and G. R. Pancoast. (*Proc. Amer. Pharm. Assoc.*, **50**, 365.) The fat removed by one of the authors from the animal, *Mephitis varians*, had the following characters: Sp. gr., 0·9166; acid number, 31·0; saponification number, 206. The acid number is probably a little too high, since the animal had slightly decomposed when the fat was removed.

Soap Analysis, Rapid Method for. F. Telle. (*Journ. Pharm. Chim.* [6], **16**, 121.) The sample having been well bulked and made homogeneous, 2 Gm. is weighed off, dissolved in 50–60 c.c. of hot distilled water, and transferred, with the washings, to a 150 c.c. separator. When the soap solution is quite cold, 10 c.c. N/HCl solution is added from a burette, followed by 20–25 c.c. of ether. The liberated fatty acids are then shaken out with ether, the aqueous layer is run out into a flask, the ether washed two or three times with water, the washings being added to the rest of the aqueous solution, and the ethereal fat solution transferred to a tared capsule. The separator is washed out with a little ether, and these washings are added to the rest. The ether is then evaporated, the residual fat dried at 95°C. until the loss between two consecutive weighings is less than 5 Mgm. The weight is then recorded as "total fatty acids." Meanwhile, the aqueous solution is titrated with N/NaHO solution, using phenol-phthalein as the indicator. The difference found in the free acid, and the amount added in the first instance (10 c.c.) indicates the amount combined with the total alkali of the soap. This number of c.c. × 1·55 gives the total per cent. of alkali as Na_2O or × 2·355 as K_2O. Free alkali is determined by a modification of Divine's method (*Year-Book*, **1901**, 114). An approximately decinormal solution of oleic acid in alcohol, containing 28·2 Gm. of oleic acid in the

litre, is employed, also an aqueous N/10 NaOH solution. Two 300 c.c. Erlenmeyer flasks are taken; into one is placed 20 c.c. of the N/10 oleic acid solution, and 50 c.c. of alcohol; in the other 2 Gm. of the soap to be examined, 20 c.c. of N/10 oleic acid, and 50 c.c. of the same alcohol. The second flask is attached to a reflux condenser, and boiled on the water bath for half-an-hour. After cooling, both this and the blank experiment are titrated back with N/10 NaOH and phenol-phthalein indicator. The difference in the two titrations indicates the amount of free alkali present. This number of c.c. $\times$ 0·155 = free Na_2O per cent. in the soap; $\times$ 0·232 = K_2O per cent.; $\times$ 0·265 = Na_2CO_3 per cent. or $\times$ 0·345 = K_2CO_3 per cent.

Sodium Phosphate, Tribasic. H. B. Eigelberner. (*Amer. Journ. Pharm.*, **74**, 596.) Although but little is to be found concerning tribasic sodium phosphate, $Na_2PO_4 12H_2O$, in current chemical literature, the manufacture of the salt is one of considerable importance, and the consumption in the United States alone amounts to between 3 and 5 million pounds per annum. Probably one-half the T.S.P. (tri-sodium phosphate) manufactured goes into the different boiler compounds, the rationale of its use being to convert the hardenable carbonates and sulphates of lime, magnesium, and other incrusting minerals into unhardenable phosphates and to neutralize the acids released by decomposition, thus—$3\ (CaSO_4 + 2H_2O) + 2(Na_3PO_4 + 12H_2O = Ca_3(PO_4)_2 + 3(Na_2SO_4 + 10H_2O)$. A corresponding reaction takes place with carbonates—sodium carbonate going into solution and calcium phosphate being precipitated.

As it renders the water perfectly clear and soft, large quantities of T.S.P. are now used in the laundries, and as a washing-powder for household use; some of the claims for it being that it saves labour, removes fruit stains, cuts grease, and saves about 50 per cent. of soap.

Tri-sodium phosphate is used in creameries to cut the scum from milk cans, and in a small way to clarify water (in place of alum).

During the past year it has been used in large quantities (under different brand names) either unmixed or in combination with borax and other chemicals, as a "casein solvent."

Tri-sodium phosphate, as found on the general market, runs between 95 and 99·5 per cent. pure. The impurities (incidental to manufacture) are sodium chloride, sulphate and carbonate. It is sometimes found adulterated with 10–40 per cent. Glauber's salt or soda ash.

Sodium Sulphite, Iodometric Titration of. W. Garsed. (*Pharm. Journ.* [4], **16**, 391.) It is found that the titration of a solution of sodium sulphite with N/10 iodine solution, invariably gives low results, however the method of manipulation may be varied. These results show marked differences among themselves, according to the conditions of the experiment. It is advised, therefore, that the method of Giles and Shearer, of dissolving the crystalline salt directly in an excess of N/10 iodine solution should be employed, then titrating back the uncombined iodine left, with N/10 hypo. solution. This method is found to give accurate results.

Stachyose. C. Tanret. (*Comptes rend.*, **136**, 1569.) The sugar which was isolated by A. de Planta and E. Schulze, from *Stachys tuberifera*, is found not to be, as generally supposed, a triose, but a tetrose of the formula $C_{24}H_{42}O_{21}$, and is identical with manneotetrose, isolated by the author from manna (*ante*, p. 115). It gives, when completely hydrolized by 3 per cent. H_2SO_4, 4 molecules of monose sugars; that is, 2 molecules of galactose, 1 molecule of levulose, and 1 molecule of glucose. With acetic acid it gives 1 molecule of levulose and 1 molecule of a triose, $C_{18}H_{32}O_{16}$. This triose is then hydrolized by sulphuric acid into 2 molecules of galactose and 1 molecule of glucose.

The triose has all the properties of manninotriose; the same optical rotation, $[\alpha]_D + 167°$, and forms the same acid, manninotrionic acid, $C_{18}H_{32}O_7$.

Stachyose and manneotetrose both crystallize with 4½ mols. H_2O, and from 90 per cent. alcohol, with 4 mols. H_2O. They have the same solubilities, the same melting points, and the same optical rotation, and when carefully purified and crystallized, the same crystalline form. There is, therefore, no doubt as to the identity of stachyose with manneotetrose.

Standard Solutions of Iodine, Preservation of. O. Schmatolla. (*Journ. Pharm. Chim.* [6], **16**, 128, after *Apoth. Zeit.*) According to the author, the familiar instability of standard iodine solutions is due to two causes, the transformation of potassium iodide into iodate, which then reacts on the iodide, so that the titre of the solution should become higher. As a matter of fact, it becomes less on account of the volatilization as a part of the iodine. This second cause being greater than the first, accounts for the observed diminution of the strength of standard iodine solutions. It is, however, easy to prepare standard solution of iodine, which may be

kept constant for 6 months at least. In the first place, it should be prepared with the purest distilled water, and secondly, the mouth of the containing bottle and the stopper should be kept perfectly dry. After pouring out the quantity of a standard solution required for filling a burette, the mouth and stopper of the bottle should be wiped perfectly dry, and after replacing, tied over with parchment paper or gutta-percha tissue. The bottle should be kept in a cool place. To titrate the thiosulphate, against which the iodine solution is set, dilute $K_2Cr_2O_7$ solution should be employed. 20 c.c. of a solution containing 3·870 Gm. $K_2Cr_2O_7$ per litre is diluted with 20 c.c. of water; 0·5 Gm. of KI and 5 c.c. of HCl are added. From this exactly 0·2 Gm. I is set free, which should require 15·76 c.c. of N/10 thiosulphate solution to use up the iodine. The titration is conducted in the usual manner, with starch solution as the indicator.

Stramonium, Fixed Oil from the Seeds of. D. Holde. (*Chem. Centr.*, **1902** [2], 1417, after *Mitt. Tech. Vers. A.*). The air-dried seeds of *Datura stramonium*, when extracted with benzol, yield about 16·7 per cent. of a greenish or brownish fixed oil, having a characteristic odour. Sp. gr. at 15°C., 0·9175; iodine number, 113; total acid number, 186. It becomes thick at 0°C., whitish and not fluid at −5°C., and ductile at −15°C. At 20°C. its viscosity is 9 times greater than that of water. It has marked drying properties at 50°C., forming, in thin layers, a hard pellicle in 13 hours. At ordinary temperatures it remains fluid for 23 days, and shows a slight pellicle in 35 days, ultimately becoming quite dry. In addition to the daturic acid of Gérard, two other fatty acids were isolated from the oil, one having the m.p. 60–62°C., and the molecular weight 261, and the other the m.p. 54°C., and the molecular weight 286.

Strophanthus hispidus, Presence of Choline and Trigonelline in the Root of. W. Karsten. (*Berichte Pharm.*, **12**, 241.) The fresh roots of *Strophanthus hispidus* are found to contain 0·06–0·07 per cent. of strophanthin as extracted by Thoms' method (*Year-Book*, **1898**, 162.) It differed, however, from the amorphous strophanthin of Thoms, in giving a crystallizable sugar on hydrolysis. After separating strophanthin, the mother liquors gave an abundant precipitate with bismuth potassium iodide. From this, the bases choline and trigonelline were liberated. Thoms has previously shown (*Year-Book*, **1898**, 162) that these alkaloids occur in strophanthus seeds.

Strychnicine, a New Alkaloid from Strychnos. W. G. Boorsma. (*Journ. Pharm. Chim.* [6], **16**, 551, after *Bull. Inst. Bot. de Buitz.*, **14**, 3.) The author has isolated a new base, strychnicine, from the fresh and dried leaves of *Strychnos nux vomica;* it occurs in colourless needles without water of crystallization, turning brown at 240°C. and forming a dark-coloured mass at higher temperatures. The free alkaloid is tasteless, and it gives no colour reactions with sulphuric acid and oxidizing agents, analogous to those furnished by strychnine. It dissolves without colour in Froehde's reagent; after long standing the solution becomes yellow with HNO_3. Unlike brucine, it gives no violet reaction with $ZnCl_2$. The solution in HCl is colourless; on boiling it with a little HNO_3 it develops an orange-red colour. A neutral or faintly acid solution of the hydrochloride is precipitated by NaOH or Ba2(OH), but the liberated base is soluble in excess of the precipitant; the solution then acquires an orange tint, which, on adding excess of HCl, is changed to violet, the colour becoming deeper on standing, and is only slowly developed if but a small amount of the alkaloid be present. NH_4OH and Na_2CO_3 do not give this reaction. Other acids, except tartaric acid, may be substituted for HCl.

Strychnicine is possessed of relatively low toxic power. It occurs in the young and adult leaves, in the pulp of the ripe fruit, in the hard shell of the fruits, and in the thin orange epicarp. It is not found in either the wood or the bark of the tree. It accompanies strychnine in the leaves of *Strychnos tiente*, but neither it nor any other base has been found in the young shoots or more developed branches of *Strychnos laurina* or *S. monosperma.*

Strychnicine was isolated from brucine and strychnine, on account of the relative insolubility of its tartrate, by means of fractional crystallization of the tartrates of the mixed bases from water. After several recrystallizations, strychnicine tartrate is obtained pure, and the base liberated therefrom in the usual manner.

Strychnine and Brucine, Determination of in Nux vomica. E. Dowzard. (*Chem. News*, **87**, 99.) *Determination of Strychnine.* The mixed alkaloids having been obtained in a pure state by Dunstan and Short's method, or a modification thereof, the separation of the strychnine is effected as follows: Dissolve the mixed alkaloids in 25 c.c. of 2 per cent. H_2SO_4 (heat, if necessary, to aid solution), filter, and wash the filter-paper with 2 per cent. H_2SO_4

until the filtrate measures 50 c.c.; cool to ordinary temperature (15–25°C.), and add 5 c.c. of nitric acid (sp. gr. 1·42); mix well, allow to stand for 15 minutes, pour into a separator containing 15 c.c. ammonia (sp. gr. 0·890) and 10 c.c. of chloroform, shake mixture for 5 minutes; after separation has taken place, the solvent is transferred to another separator and the alkaline liquid again extracted with 10 c.c. of chloroform.

To 44 c.c. of water add 1 c.c. of ammonia (sp. gr. 0·890). The chloroformic solution is shaken for 20 seconds with 15 c.c. of the above dilute ammonia solution. After separation has taken place, the solvent is transferred to another separator; this treatment is repeated twice. (The chloroformic solution is washed with dilute ammonia to free it from a small quantity of colouring matter). The solution of strychnine is transferred to a tared wide-mouthed short-necked flask (capacity about 150 c.c.), the solvent is distilled off until about 1 c.c. is left; 1 c.c. of absolute alcohol is added, and the flask placed in an air bath kept at a temperature of about 80°C.; when the last trace of alcohol has been driven off, the temperature is raised to 100°C. The flask is weighed till constant. [Compare with succeeding note by H. M. Gordin, p. 160.—Ed. *Year-Book.*]

Determination of Brucine. Advantage is taken of the well-known colour reaction of brucine with HNO_3 for the colorimetric determination of that alkaloid. A standard solution of brucine is prepared containing 0·08 Gm. of the base in 50 c.c. Under the conditions of the test this will give a tint corresponding to 100 on the colorimetric scale. 50 c.c. of a solution of 0·10 Gm. of mixed alkaloids is treated, simultaneously with the 50 c.c. of standard brucine solution, with 5 c.c. of HNO_3 (sp. gr. 1·42), the mixtures agitated, and transferred to a Gallenkamp colorimeter. 5 minutes after the addition of the acid the tint of the two liquids is compared, the mean of 6 readings being taken and the amount of brucine in the solution of mixed alkaloids calculated therefrom. The readings should be done by diffused daylight, and the instrument should be standardized with a solution of brucine before use.

The determination of the strychnine and brucine by the methods given above may be made on the same portion, thus placing a check on the results. In this case, 10 Gm. of the powder, or 10 c.c. of the liquid extract, should be operated on.

The filtered chloroformic solution of mixed alkaloids is made up to 50 c.c. 10 c.c. is evaporated, and the residue dried at

105–110°C. for total alkaloids. The remaining 40 c.c. is evaporated to dryness, dissolved in 40 c.c. of 2 per cent. H_2SO_4, filtered, and the filter-paper washed with 2 per cent. H_2SO_4 until the filtrate measures 100 c.c. 50 c.c. of this solution is used for the determination of strychnine, the amount of mixed alkaloids in the remaining 50 c.c. is calculated, and the solution diluted until 50 c.c. contains 0·1 Gm.; the brucine is then determined as above.

In the following example the figures given were obtained in the examination of a sample of *Nux vomica* powder. The strychnine, brucine, and total alkaloids were determined separately:—

Nux vomica Powder.

50 c.c. chloroform = alkaloids from 10 Gm. of sample.

10 c.c. of above = 0·064 Gm. mixed alkaloids = 3·2 per cent.

The remaining 40 c.c. was evaporated, and the residue dissolved in 100 c.c. 2 per cent. H_2SO_4.

50 c.c. of above = 0·0585 Gm. strychnine = 1·462 per cent.

50 c.c. of above = 0·1280 Gm. mixed alkaloids; after diluting to 64 c.c., 50 c.c. = 0·100 mixed alkaloids.

Average of six readings, 67·5 (100:67·5::0·08:0·054)

$$\frac{0·054 \times 3·2}{0·1} = 1·728 \text{ per cent. brucine.}$$

	Per cent.
Found—Total alkaloids	3·200
Strychnine	1·462
Brucine	1·728
Brucine calculated	1·738

Strychnine, Determination of in Presence of Brucine. H. M. Gordin. (*Archiv der Pharm.*, **240**, 641, and *Proc. Amer. Pharm. Assoc.*, **50**, 336.) The author modifies the process of Keller, which he finds to give results about 4 per cent. too low. The loss is attributed to the partial alteration of the alkaloid by undue exposure to the action of nitric acid. The use of ammonia for liberating the alkaloids is abandoned, and soda solution employed instead. Chloroform alone is used as the immiscible solvent, in place of the ether chloroform mixture employed by Keller. 2–3 decigrammes of the mixed alkaloids are dissolved on the water bath in 15 c.c. of 3 per cent. H_2SO_4. When cold, it is treated with 3 c.c. of a previously cooled mixture of equal parts (by weight) of HNO_3 (1·42) and water. After exactly 10 minutes'

contact the mixture is transferred to a separator, made alkaline with soda solution, and the strychnine shaken out in the usual manner with $CHCl_3$. The $CHCl_3$ extract is distilled in a tared flask after adding a little amyl alcohol, as recommended by Bird (*Year-Book*, **1901**, 117) to prevent decrepitation of the alkaloid, the residue dried at 130–140°C. to constant weight, and weighed as strychnine.

Strychnine, Separation of from Brucine. A. B. Lyons. (*Pharm. Review*, **20**, 253, through *Journ. Pharm. Chim.* [6] **16**, 139.) Advantage is taken of the fact that while strychnine sulphate is practically insoluble in 10 per cent. H_2SO_4, brucine sulphate is very soluble. Working with an experimental mixture of strychnine, 45, and brucine, 55, portions varying in amount from 50–150 Mgm. of total alkaloid were taken, treated with 10 per cent. H_2SO_4 in the proportion of 1 c.c. to every 10 Mgm. of alkaloids. After constant agitation for 10 minutes, and then at frequent intervals for 2 hours, the solution was passed through a small filter, washed with a few drops of H_2SO_4 10 per cent., and the strychnine sulphate left on the filter, decomposed with ammonia and extracted with chloroform. In each case the loss of strychnine was found to be about 1·75 Mgm. for each c.c. of acid used.

To determine the proportion of strychnine in the total alkaloid extracted from nux vomica or its preparations, the above process is thus conducted: For each 15 Mgm. of alkaloids 1 c.c. of 10 per cent. H_2SO_4 is added in a capsule and frequently agitated for at least 1 hour. The mixture is then filtered, the insoluble residue being entirely transferred to the filter, and washed with 1 c.c. of acid. The filter and its contents are then replaced in the capsule and treated with 10 c.c. of $CHCl_3$ and 3 c.c. of 10 per cent. AmHO, agitated with a glass stirrer until all the alkaloid is dissolved and the liquid transferred to a separator. The filter is then washed with two successive washings, each of 5 c.c. of $CHCl_3$, which are added to the rest in the separator. The chloroform solution is then received in a tared capsule, evaporated to dryness, after adding 2 c.c. of alcohol, dried to constant weight and weighed. To the weight obtained 1·75 Mgm. is added for each c.c. of acid used, the result being the strychnine present in the total alkaloids. As an alternative to the above, a double operation may be performed, one portion of alkaloid being treated as above, the second being dissolved in the acid solution obtained from the first, which is saturated with strychnine sulphate. The weight of alkaloidal strychnine obtained from this second portion may be weighed

direct without any correction, since the alkaloids in it have been treated with acid saturated with strychnine sulphate.

Sulphurous Acid, Determination of in Fruit Preserves. (*Zeit. für Analyt. Chem.*, **41**, 33, through *Annales de Chim. Analyt.*, **8**, 153.) 50 Gm. of the preserve, finely divided, is agitated mechanically with 400 c.c. of recently-boiled distilled water for half-an-hour; the volume is then made up to 500 c.c., and the mixture again shaken and filtered. To determine the total sulphurous acid, 200 c.c. of N/HaOH solution is introduced into a 500 c.c. flask and 100 c.c. of the above filtrate is added to it. The mixture is allowed to stand for 15 minutes, then 20 c.c. of H_2SO_4 1 : 5 and starch paste is added. The liquid is titrated with a solution of iodine 1 Gm. per litre, which is added until the blue colouration is persistent for half a minute. To determine the free sulphurous acid, 100 c.c. of the aqueous fruit filtrate is taken, 10 c.c. of H_2SO_4 1 : 5 is added, and the titration performed as above, without the addition of any NaOH. As a rule but little free SO_2 is found to be present. The results obtained by this method compare favourably with gravimetric determination by the process of Haas, as modified by Beythren and Bohrisch.

Sulphurous Acid, B.P., Note on the Preparation of. Richard A. Robinson, Jun. (*Pharm. Journ.* [4], **15**, 551.) A large glass jar (capacity, 4 gallons or more), containing 2 gallons of distilled water, is fitted with a doubly-bored cork; through the one hole is a short glass tube leading to a mercury trap outside; through the other a long bent tube passing below the surface of the water in the jar. The arm of this tube is securely connected by rubber tubing to a lead pipe at the top of a cylinder of liquid sulphur dioxide, after the sealed end of the pipe has been snipped off with a strong pair of scissors. The evaporation of the SO_2 is not so rapid as to cause either unpleasantness or appreciable loss of gas while the connexion is being made. The apparatus may then be left practically without attention till the evaporation is completed.

The process is best conducted in the open air, since, apart from the possibility of an escape of the gas, the lower temperature favours solution. In a recent experiment, from a tin containing nearly 20 oz. weight of liquid SO_2, 328 fl. oz. of solution were obtained which, on estimation with iodine, required diluting to 368 fl. oz. to correspond with the official requirement of 5 per cent. of SO_2. The time taken in evaporating was just 5 hours. The rate of evaporation may be controlled by immersing the cylinder in ice, or other means, but generally any such course is unnecessary. It

may be mentioned that the cost of a tin of liquid SO_2 (about 20 oz.) is only about one shilling, so it will be seen that there is considerable economy in the process.

Stylophorum diphyllum; Identity of Chelidoxanthin with Berberine. J. O. Schlotterbeck (*Proc. Amer. Pharm. Assoc.*, **50**, 404) shows that *Stylophorum diphyllum* and *Chelidonium majus* are so closely related from the botanical point of view that they might properly be considered species of the same genus. From the chemical standpoint they are just as closely related. For many years it has been stated in literature, as a result of the work of Probst, that *Chelidonium* contains a yellow, bitter substance called chelidoxanthin. The exact nature of this substance was never determined, it being called an alkaloid by some, and a bitter principle by others. In the course of an investigation by the author upon *Stylophorum diphyllum*, this yellow body in a very impure state was encountered. The yield from 50 lb. of crude drug was quite considerable, and permitted a study of its physical and chemical properties. It was not long before berberine was suspected, and the experiments upon the colour compound soon demonstrated it to be the yellow alkaloid which is so widely distributed in the Ranunculaceæ, Berberidaceæ, Menispermaceæ, Rutaceæ, and Papaveraceæ. Fresh plants of both *Stylophorum* and *Chelidonium* grown in a botanical garden were carefully examined chemically, and found to contain berberine. It is believed that chelidoxanthin is merely impure berberine.

Tannin, Determination of. P. Feldmann. (*Pharm. Zeit.*, **48**, 155.) The substitution of a standard solution of calcium hypochlorite for the permanganate solution employed as the oxidizing agent in the Neubauer-Loewenthal method of tannin determination is advocated. The solution is prepared by extracting 12·5 Gm. of commercial chlorinated lime with water, and diluting the solution to 1 litre. According to the author, the end reaction with the indigo indicator is much sharper with this solution than with permanganate, particularly if care be taken not to use more than 2 c.c. of a 5 per mille solution of indigo sulphate. It is found that in the case of wine, the alcohol, sugar and glycerin normally present have no reducing action on the hypochlorite solution. The determination of tannin in wine may therefore be conducted thus: 10 c.c. of the wine is diluted with 190 c.c. of water; to the solution are added 2 c.c. of the indigo reagent, and 2 c.c. of H_2SO_4 20 per cent.; the mixture is then titrated with the standard hypochlorite solution, which has first been set against

a solution of pure tannin containing the same amount of indigo solution. A second determination is made with 10 c.c. of wine, 30 c.c. of water, and 3 Cgm. of animal charcoal, which are heated together on the water bath, then filtered and the filter washed to produce 200 c.c. of filtrate. This is then titrated as before, after the addition of the indigo. The difference in the two determinations is due to the tannin removed by the animal charcoal. In substances other than wine, dried powdered raw hide is used to remove the tannin instead of charcoal. The figures obtained by this method are distinctly higher than those given by the permanganate Neubauer-Loewenthal process.

Thallium Oxalates. W. O. Rabe and H. Steinmetz. (*Berichte*, **35**, 4447.) By digesting moist freshly precipitated TlO.OH with a large excess of saturated aqueous solution of oxalic acid, a salt occurring in small crystals was obtained which, when washed with alcohol and ether, and dried in the air, had the composition $TlH(CO_2)_4.3H_2O$. The precipitate obtained in the presence of strong mineral acids from thallium salts with oxalic acid had, generally, the composition $TlH_2(CO_2)_5$. Neither of these acid oxalates could be obtained anhydrous, since they decompose on drying. If TlO.OH, or one of the acid oxalates be heated with aqueous oxalic acid solution, a heavy minutely crystalline precipitate of $Tl_2(CO_2)_4$ results. By passing dry NH_3 gas into an ice-cold alcoholic or ethereal solution of the acid oxalates, the double salt, $Tl(NH_4)(CO_2)_42NH_3$, is obtained. By digesting this oxalate with alcoholic ammonia, at 45°C. for 2 hours, the ammonium salt, $TlNH_4(CO_2)_4$, results. The analogous pyridine salt, $Tl(HPy)(CO_2)_4$, may be obtained in a similar manner. A triple derivative of the acid oxalate may be obtained by mixing 1 part with 10 times its weight of a solution of oxalic acid, 6, pyridine, 9, in water, 20, and cooling to 0°C. The filtrate throws out, on the addition of alcohol and pyridine (1 : 10) with a little ether, glittering spangles of micro-crystalline, doubly refractive scales, having the composition $Tl(HPy)_3(CO_2)_6$. The soluble pyridine double salt, by contact with ammonia in alcohol ether solution, becomes converted in 1 or 2 days, into the ammonium double salt, $Tl(NH_4)_3(CO_2)_6$.

Thiosemicarbazide as a Reagent for Aldehydes and Ketones. M. Freund and A. Schander. (*Berichte*, **35**, 2602, through *Chem. Centr.* [2], **73**, 572.) The authors describe the characters of the thiosemicarbazide compounds of several aldehydes and ketones, and suggest that these characters may serve for

their identification. Among these are: *Acetaldehyde thiosemicarbazone*, $CH_3.CH:N.NH.CS.NH_2$; forms white crystals, m.p. 146°C. *Citral thiosemicarbazone*, $C_{11}H_{19}N_3S$.; crystals m.p. 107–108°C. *Benzaldehyde thiosemcarbazone*, $C_8H_9N_3S$.; yellowish white crystals, m.p. 160°C. *Ortho-oxybenzaldehyde thiosemicarbazone*, $C_8H_9ON_3S$.; crystallizes from hot water; frits at 215°C.; m.p. about 231°C. *Para-oxybenzaldehyde thiosemicarbazone*, $C_8H_9ON_3S$.; crystallizes in needles from alcohol; m.p. 224°C. *Cinnamic aldehyde thiosemicarbazone*, $C_{10}H_{11}N_3S$; crystallizes in white needles from ether; m.p. 123°C. *Vanillin thiosemicarbazone*, $C_9H_{11}O_2N_3S$.; yellow needles, m.p. 196–197°C.; soluble in water. *Acetone thiosemicarbazone*, $C_4H_9N_3S$; crystallizes from aqueous solution; frits at 174°C.; is wholly melted at 179°C.

Thorium, Separation of from Rare Earths. F. J. Metzger. (*Journ. Amer. Chem. Soc.*, **24**, 901.) A saturated solution of fumaric acid in 40 per cent. alcohol precipitates thorium completely from neutral solutions, to which 40 per cent. of their volume of alcohol has been added, while under these conditions the only other metals that give precipitates are zirconium, erbium, silver and mercury. This precipitation serves as an accurate and rapid separation of thorium from the other earths in monazite, and by its use the thoria can be determined in about one-third the time required by the methods now in use and with equal if not greater accuracy.

As the thorium-carbon ratio in thorium fumarate is 1:4 thorium and fumaric acid react molecule for molecule. By the aid of a blast-lamp, white vapours are driven off from the thoria left in the boat after the combustion of thorium fumarate in a stream of oxygen (a fact as yet not explained).

Rare-earth oxalates and thorium thiosulphate are completely converted into the hydroxides by heating to boiling in a strong solution of potassium hydroxide, giving a convenient method for the conversion of those salts into the nitrates.

Thymol in Algerian Origanum. Battandier. (*Journ. Pharm. Chim.* [6], **16**, 536.) The essential oil of *Origanum floribundum*, Mumby, *O. cinereum*, De Noe, indigenous to the mountains of Algeria, contains about 25 per cent. of phenols soluble in caustic alkali. The mixed phenols crystallize almost immediately when touched with a crystal of thymol, the uncrystallizable residue being carvacrol. The plant is not sufficiently abundant to render it a source of thymol of commercial importance.

Toad Poison. C. Phisalix and G. Bertrand. (*Comptes rend.*, **135**, 46, and G. Bertrand, *ibid.*, 49.) The authors conclude that the so-called bufonin of Faust is not the true toxic principle of toad poison. The substance described as such by him occurs, as he states, in the alcoholic extracts of the skin of the toad, but is not present in the pure secretion of the parotid gland of the animal. They find that this secretion contains two toxic bodies, *bufotalin* and *bufotenin*. The former is of a resinoid nature, and gives analytical figures concordant with the formula $C_{119}H_{171}O_{25}$. It is neutral in reaction, soluble in alcohol, but insoluble in water. Bufotenin, however, is very soluble in the latter liquid, and remains in the mother liquor after the separation of bufotalin. Bufotalin arrests the heart in systole; bufotenin acts as a paralysant, like curare. Bertrand has extracted the so-called bufonin of Faust from toad skins, and finds that it is nothing but impure cholestrin containing enough bufotalin to give it a certain toxic influence on the heart when injected into frogs.

Tobacco, Chemistry of. Gawalowski. (*Oester. Zeit. für Pharm.*, **56**, 432.) The so-called tobacco camphor, or nicotianine, is a mixture of nicotine valerianate, camphorate, oxycamphorate and pyridylcarbonate. Nicotine pyridylcarbonate is the most highly toxic principle of tobacco, while the other salts of that base impart to it fragrant characters.

Tobacco, New Basic Substance in. Frankel and Woqrinz. (*Journ. Pharm. Chim.* [6], **16**, 273.) According to the authors, the aroma of tobacco is due to a volatile base, which is isolated as picrate from the milky distillate obtained by distilling the leaves of different varieties of tobacco. When recrystallized, this picrate forms brilliant, long, silky needles, m.p. 214°. This base is probably identical with that observed by Hermbstatt and by Vanquelin, and named nicotianine. (Compare *Year-Book*, **1901**, 122.)

Tuberose, Essential Oil of. A. Hesse. (*Berichte*, **36**, 1459.) It is found that tuberose flowers yield a much larger percentage of oil when extracted by the process of *enfleurage* than when treated by solvents, such as petroleum ether. By the former process 1,000 kilos of flowers yielded 108 Gm. of oil, against 56 Gm. obtained by extraction with petroleum ether. The residual flowers from the latter extraction gave another 10 Gm. of oil on steam distillation. The *enfleurage* oil differed from that obtained by petroleum extraction, in containing methyl salicylate; otherwise the constituents were the same, consisting mainly of esters; methyl anthranilate,

benzyl alcohol and benzyl benzoate were detected. The petroleum-extracted oil contained only 1·13 per cent. of methyl anthranilate, against 5 per cent. in the *enfleurage* oil. When fresh tuberose flowers were submitted to steam distillation, the oil obtained differed entirely from that resulting from extraction or *enfleurage*, and had an unpleasant odour.

Tuberose, Essential Oil of. (*Schimmel's Report, April,* **1903**, 74.) Verley has isolated (*Year-Book*, **1900**, 62) the ketone tuberone from oil of tuberose. The concrete extract of tuberose consists of a brown unctuous mass, from which 5 per cent. of volatile oil could be obtained by steam distillation. The residue consisted of wax and paraffin-like bodies, having no odour value. The distillate was found to contain methyl anthranilate. From the fraction of the volatile oil, which should contain tuberone, no oxime could be obtained by means of hydroxylamine hydrochloride. The chief constituent of the oil was found to be methyl benzoate.

Turmeric, Diphenylamine as a Reagent for. O. E. Bell. (*Pharm. Journ.* [4], **15**, 551.) Turmeric gives with diphenylamine, in acid alcoholic solution, a fine purple coloration. No other vegetable colouring matter has been found to give a similar reaction, so that the test is available for turmeric mixed with other substances. 1 part of turmeric in 200 parts of rhubarb, or in 1,000 parts of mustard, is readily detected.

The following is the best method of applying the test: A drop of the reagent is placed on a clean microscopic slide by means of a glass rod, a small quantity of the powder under examination is spread evenly over the entire surface of a cover glass, and carefully dropped over the reagent on the slide.

The slide is then examined microscopically with an inch objective, when, if turmeric be present, spots of a fine purple colour will be observed scattered throughout the field of vision. The number of these purple spots can be employed in estimating approximately the amount of the drug present by comparison with standard specimen slides containing a known percentage of turmeric.

The reagent consists of pure diphenylamine, alcohol 90 per cent., and pure sulphuric acid:—

Diphenylamine	1 Gm.
Alcohol 90 per cent.	20 c.c.
Pure sulphuric acid	25 c.c.

The diphenylamine is dissolved in the 90 per cent. alcohol, and

the sulphuric acid is then carefully added. On cooling, the reagent is ready for use.

In comparing this with the boric acid test for turmeric, it is found that the diphenylamine test is: (1) Much more delicate; (2) more conveniently applied; (3) requires less time to perform.

Uranium Salts and Hydrogen Peroxide, Colour Reaction for. J. Aloy. (*Chem. News*, **87**, 102.) On adding hydrogen peroxide and then potassium carbonate either in the solid state or in very concentrated solution to a compound of uranium, a solution is obtained which has a very beautiful red colour.

This method is very general, and can be applied to not only the yellow salts, but also to the uranous compounds and even to the anhydrous oxides. Still, in this latter case, it is preferable first to transform the oxide into nitrate by means of nitric acid. Further, this reaction succeeds in the presence of metals whose salts give with carbonate of potassium a precipitate insoluble in an excess of the carbonate, which is the general rule.

Potassium bicarbonate is not capable of replacing the neutral carbonate, and, under the same conditions, gives a yellow liquid which becomes red on heating.

The sensitiveness of the method may be increased by making use of the property of the red compound of being insoluble in alcohol. If to the red solution obtained be added two or three times its volume of strong alcohol, a red precipitate is obtained, which collects rapidly at the bottom of the vessel used.

The same reaction may be used for the detection of hydrogen peroxide. A soluble uranic salt, such as the nitrate, is treated with potassium carbonate in sufficient quantity to dissolve the precipitate which is first formed. The addition of hydrogen peroxide to this solution produces a beautiful red colouration. If it be wished to detect traces of hydrogen peroxide it is better to operate in a different manner, and to make a solution of uranic nitrate in alcohol 95 per cent., and then add a few drops of the solution to be tested and a few crystals of carbonate. In the presence of hydrogen peroxide either a red precipitate, which collects at the bottom of the vessel, or a red liquid is formed.

Urine, Crystalline Colouring Matter from. S. Cotton. (*Journ. Pharm. Chim.* [6], **16**, 258.) A crystalline colouring matter has been separated from urine, in small quantity, in the form of deep violet prisms, somewhat resembling hæmin, which are almost absolutely insoluble in water, but soluble with facility in most immiscible organic solvents. When left exposed to the air for

some time, they resinify, but they may be easily preserved in glacial acetic acid. The spectroscopic absorption band closely resembles that of hæmatine in acid solution, but differs in position. It is not an oxidation, but a decomposition product, and may be obtained by the action of all the mineral acids, except H_3PO_4, on urine. Two and a half litres of urine is treated with 100 Gm. of HNO_3 of ordinary strength. The mixture is then boiled in a flask with a long neck, so as to prevent contact with the air, until the volume is reduced to one-fifth. It is then cooled and filtered. Practically all the colouring matter, accompanied by carbonaceous products and other impurities, is left on the filter. This residue is then extracted with chloroform; the chloroformic solution is shaken out first with a very dilute solution of alkali to remove traces of resins and acids, and then four successive times with water; it is then dried by passing through several successive dry filters, and finally allowed to evaporate spontaneously, when the violet prisms will be obtained.

Urine, Detection of Bile in. Nakayama. (*Zeit. für Physiolog. Chem.*, **36**, 398, through *Journ. Pharm. Chim.* [6], **17**, 60.) 5 c.c. of the urine is treated with 5 c.c. of $BaCl_2$ solution, and the precipitate formed separated by centrifugating. This is collected and boiled in 2 c.c. of a reagent obtained by dissolving Fe_2C_6, 4 Gm., HCl, 1 Gm., in alcohol 95 per cent., 99 Gm. The boiled liquid will give a bright green or bluish green colour in the presence of bile. On the addition of fuming HNO_3, this colour is changed to violet, then to red. The above is a modification of Huppert's test, but is much more delicate than the original, since it will reveal the presence of 1 : 1,200,000 of bile.

Urine, Detection of Bile Pigments in. Badouin. (*Répertoire* [3], **15**, 12.) Twin test tubes are three-parts filled, one with the urine to be tested, the other with water. To each is added 2 drops of a 1:200 solution of fuchsine; if bile be present the reddish violet tint of the fuchsine changes to orange yellow. If the colour of the urine examined be high, it should be first diluted with water to the normal tint before adding the fuchsine solution. The presence of indican and urobilin does not interfere with the reaction.

Urine, Di-ethyl-Amido-benzaldehyde as a Reagent for Indican in. E. Ehrlich. (*Merck's Report*, **1902**, 52.) A reagent consisting of strong HCl 150, water 150, and di-ethyl-amido-benzaldehyde 1, affords a delicate and simple test for the presence of indican in urine. From 1 to 1·5 c.c. of the urine is mixed with an equal

volume of the reagent and boiled. The brownish mixture is then cooled and treated with excess of NH_4HO or KHO, when a fine red colour is developed in the presence of indican, which varies in intensity with the amount present.

Vaccinium vitis idæa, Constituents of. M. Karger. (*Pharm. Zeit.*, **47**, 965.) The leaves of *Vaccinium vitis idæa* contain no nitrogenous base; a small trace of urson is present. The organic acids consist of tannic, gallic and quinic acids, and possibly ellagic acid; they contain as well: arbutin, hydroquinone, ericolin, and ericinol. The best time for gathering the leaves is September, and they should be dried at ordinary temperatures, since by exposure to heat the nature of the chemical constituents is profoundly altered. No salicylic or benzoic acids were found in the leaves or flowers of the plant, but benzoic acid occurs in the herb. The active principle of the plant is hydroquinone; the presence of this accounts for the toxic effect observed from large quantities of the leaves. It is to this also that the medicinal effect is due. The best preparation for pharmaceutical use is, according to the author, an aqueous fluid extract of the leaves prepared without heat.

Vanadium Silicides. H. Moissan and — Holt. (*Comptes rend.*, **135**, 78, and 493.) On heating V_2O_3 with 5 times its weight of pure silicon in the electric furnace, reaction takes place according to the equation $2V_2O_3 + 11Si = 4VSi_2 + 3SiO_2$.

The vanadium silicide is then isolated by treating the button with a 10 per cent. solution of KOH on the water bath until gas ceases to be evolved: the crystalline deposit is washed by decantation, then extracted on the water bath with 50 per cent. HNO_3 and strong H_2SO_4. After washing, the slight accompanying impurity of graphite is removed by means of floating on bromoform. The silicide may also be obtained by igniting with magnesium and barium peroxide, a mixture of silicon, vanadic acid and magnesium powder. It is then purified as described above. Vanadium silicide, VSi_2, occurs in brilliant, metallic prisms, having the sp. gr. 4·42, which scratch glass. It is very stable. It is soluble in fused silicon, from which it crystallizes on cooling. Alkalies and mineral acids, except HCl, have no action on it. The latter acid, even when dilute, attacks it in the cold. It is not attacked by fluorine at ordinary temperatures, but at a red heat it burns in that gas. Chlorine and bromine, under like conditions, combine without burning. Iodine has only a very superficial action on it. Oxygen, H_2S, and sulphur are practically inert with it at the temperature of melting glass. When VSi_2 is heated in a cur-

rent of HCl, a colourless liquid boiling at +32°C. is formed, together with VCl_3 and VCl_4; this is silici-chloroform, $SiHCl_3$. In addition to the foregoing, another silicide, V_2Si, is obtained by heating together excess of vanadium oxide or vanadic acid and silicon, when the compound is formed according to the equation $2V_2O_3 + 5Si = 2V_2Si + 3SiO_2$. It may also be obtained by the action of silicon on vanadium carbide, or by fusing together a mixture of vanadium oxide, silicon and carbon thus: $2V_2O_3 + 2Si + 3C = 2V_2Si + 3CO_2$. The fused mass is digested for several hours with HNO_3 to remove the carbide, then with 10 per cent. KOH. The new silicide occurs in silvery white, brittle prisms, having a bright metallic aspect. The sp. gr. is 5·48 at 17°C. It is more readily attacked by fluorine, chlorine, and especially by bromine, than VSi_2. When heated in the electric furnace in melted silicon it decomposes, forming VSi_2.

Vanilla Extracts (Essences), Analysis of. A. L. Winton and M. Silverman. (*Journ. Amer. Chem. Soc.*, **24**, 1128.) *Determination of Vanillin and Coumarin.* The following modification of Hess and Prescott's method is adopted: De-alcoholize 25 Gm. of the extract in an evaporating dish upon a water bath, at a temperature of about 80°C., adding water from time to time to retain the original volume. After removal of the alcohol, add normal lead acetate solution, drop by drop, until no more precipitate forms. Stir with a glass rod to facilitate flocculation of the precipitate, filter through a moistened filter, and wash 3 times with a few c.c. of hot water. Cool the filtrate and extract with ether by shaking out in a separator. Use 15–20 c.c. of ether at each separation, repeating the process 3 or 4 times, or until a few drops of the ether, evaporated upon a watch glass, leaves no residue. Place the combined ether extracts containing all of the vanillin and coumarin in a clean separator, and shake out 4 or 5 times with 2 per cent. ammonia, using 10 c.c. for the first, and 5 c.c. for each subsequent shaking.

Set aside the combined ammoniacal solutions for the determination of vanillin.

Wash the ether solution into a weighed dish, and allow it to evaporate at the room temperature. Dry in a desiccator and weigh. Usually the dried residue is pure coumarin. Treat the residue with 5–10 c.c. of cold petroleum ether, boiling between 30 and 40°C., and decant off the clear liquid into a beaker. Repeat the extraction with petroleum ether until a drop, evaporated on a watch glass, leaves no residue. Dry the dish for a few mo-

ments in a water oven, cool and weigh. Subtract the weight of the dish and the residue (if any) from the weight previously obtained after evaporation with ether, thus obtaining the weight of pure coumarin. Allow the petroleum ether to evaporate at the room temperature, and dry, if necessary, in a desiccator. The residue should be crystalline and have a melting point of 67°C. This, with the characteristic odour of coumarin, is sufficient for its identification.

Slightly acidulate the ammoniacal solution reserved for vanillin with 10 per cent. hydrochloric acid. Cool and shake out in a separatory funnel with 4 portions of ether as described for ether extraction. Evaporate the ether at room temperature in a weighed platinum dish, dry over sulphuric acid, and weigh. Treat the residue with boiling ligroin (b.p. 80–85°C.), decanting into a dry beaker. Repeat the treatment until all vanillin is removed. Dry the dish and residue (if any) for a few moments at 100°C. and weigh; deduct the weight from the weight of the ether residue. The difference is the weight of the vanillin. Evaporate the ligroin at ordinary temperatures, and dry in an exsiccator. The residue should be crystalline, and melt at 80–81°C.

Tests for Caramel, Coal-tar Dyes, etc. Valuable indications of the nature of an extract are obtained in the process of determination of vanillin and coumarin. Pure extracts of vanilla beans give, with lead acetate, a bulky, more or less glutinous, brown-grey precipitate, and a yellow or straw-coloured filtrate, whereas purely artificial extracts coloured with caramel give a slight, dark brown precipitate and a dark brown filtrate. If both vanilla bean extract and caramel are present, the precipitate is more or less bulky and dark-coloured, and the filtrate is more or less brown. The solution remaining after extraction of the vanillin and coumarin with ether, if dark-coloured, should be tested both for caramel and coal-tar colours.

The most satisfactory test for caramel is to shake with fuller's earth, as recommended by Crampton and Simons. If the colour is due to caramel and a grade of fuller's earth is used, which experience has proved suitable, the solution, after filtering, is yellow or colourless. This test does not positively identify the colour, as some other brown substances may give similar reactions, but no such substance is liable to be present in vanilla extract.

Coal-tar dyes may be tested for by Arata's method.

The following results were obtained with 5 extracts made by the

authors, 1 extract of Tonka beans and 16 commercial specimens of vanilla extracts :—

	Vanillin.	Coumarin.	Total residue.[1]	Cane-sugar.	Glycerin.	Solids other than cane-sugar.	Alcohol by weight.	Colouring.
U.S.P. Mexican pods	0·13	0·00	22·60	19·90	0·00	2·70	87·96	natural
U.S.P. Mexican pods (cut)	0·07	0·00	23·10	19·20	0·00	3·90	89·92	"
U.S.P. South American pods	0·22	0·00	22·00	19·00	0·00	3·00	88·58	"
U.S.P. Bourbon pods	0·14	0·00	23·13	20·40	0·00	2·73	88·32	"
U.S.P. Tahiti pods	0·11	0·00	21·75	20·00	0·00	1·75	88·84	"
U.S.P. Tonka pods	0·00	0·21	—	—	—	—	—	"
Commercial extract (not found adulterated)	0·08	0·00	21·84	10·86	8·87	2·61	40·00	"
Commercial extract " "	0·18	0·00	13·52	0·90	10·76	1·86	27·51	"
Commercial extract " "	0·15	0·00	16·43[2]	4·54	4·54	7·35[2]	21·27	"
Commercial extract " "	0·09	0·00	16·72	15·44	0·00	1·28	20·90	"
Commercial extract " "	0·22	0·00	22·66	20·00	0·00	2·66	23·79	"
Adulterated commercial extract	0·22	0·08	0·86	0·47	0·00	0·39	6·34	artificial
Adulterated " "	0·68	0·15	14·00	10·64	2·42	0·94	17·82	natural
Adulterated " "	0·02	0·10	14·34[3]	0·75	0·00	13·59[3]	14·15	"
Adulterated " "	0·15	0·04	15·15	12·28	0·00	2·87	5·28	artificial
Adulterated " "	0·14	9·05	12·94	0·60	9·74	2·60	41·42	natural
Adulterated " "	0·24	0·18	14·62	10·92	0·00	3·70	11·91	"
Adulterated " "	0·07	0·00	14·35	11·20	0·00	3·15	31·72	artificial
Adulterated " "	0·06	0·23	36·16[2]	12·96	0·00	23·20[2]	7·58	"
Adulterated " "	0·01	0·09	13·44	11·14	0·00	2·30	9·68	"
Adulterated " "	0·04	0·11	26·54	21·00	0·00	5·54	10·78	"
Adulterated " "	0·06	0·05	35·50	31·88	0·00	3·62	18·36	natural

[1] Includes glycerin. [2] Contains glucose. [3] Contains invert sugar.

Vanilla Extracts, Detection of the Addition of Tonka Bean in. (*Pharm. Centr.*, **43**, 597.) The presence of Tonka bean, or of coumarin, added as a "fortifying" agent to vanilla essence, may be detected as follows: A portion of the essence is evaporated to dryness, the residue fused with caustic potash, saturated with hydrochloric acid and treated with a drop of ferric chloride solution. In the presence of coumarin or of Tonka bean, a violet colour due to the salicylic acid produced by the action of the KOH, in fusion, or the coumarin, will be obtained.

Vanillin, Determination of, in Vanilla. A. Moulin. (*Bull. Soc. Chim.*, **29**, 278.) The method is a colorimetric one, depending on the formation of methyl picrate when vanillin is treated with nitric acid. This reaction is quantitative, and by matching the tint produced with a similar colour given by a known quantity of pure vanillin, the amount present in the substance under examination may be rapidly determined. The colorimetric standard is thus prepared: A known weight of vanillin, say 0·5 Gm., is treated with a mixture of sulphuric acid, 10 c.c., and acetic acid, 100 c.c. When solution is complete, a few crystals of KNO_3 are added; the mixture is then heated on the water bath for 1 hour and set aside for 12 hours. The liquid is then made up to 100 c.c. A standard colour solution is thus obtained, each c.c. of which = 0·005 Gm. of vanillin. By diluting known volumes of this with water, standard tints representing any quantity of vanillin are obtainable. From 3 to 6 Gm. of the vanilla to be examined, finely divided, is weighed off, and extracted by maceration with ether in successive portions, each of 50–60 c.c.; 3 or 4 treatments will generally be sufficient. The ether extracts are bulked and treated with 10 Gm. of animal charcoal to remove colouring matter. The liquid is then decanted, filtered through cotton wool, the filter washed with a little ether, and the solvent distilled off. The residue of distillation is then treated with 20 c.c. of the mixture of KNO_3, sulphuric and acetic acids, and treated as described above, in preparing the colour standard. When action is complete, in 12 hours, the liquid is decanted, and the flask washed out with several portions of water so as to bring the volume of the whole to 75 c.c. The copious resinoid precipitate which is formed is filtered out, and the filter washed to bring the total volume of filtrate up to 100 c.c. The colour of a known volume of this filtrate is then matched by a comparison with the standard colour solution, as in "Nesslerizing." A difference of 0·005 Gm. of vanillin is thus readily detected.

Verbena triphylla, Essential Oil of. E. Theulier. (*Rev. gèn. de Chim.*, **5**, 324, through *Chem. Centr.*, **1902** [2], 1201.) The fresh leaves distilled at Grasse yielded 0·072 per cent. of essential oil; sp. gr. at 13°C., 0·919; $[\alpha]_D = -16° 20'$; esters calculated as linalyl acetate, 11·2 per cent.; the oil is insoluble in 80 per cent., soluble in 90 per cent. alcohol. The latter solution deposits a waxy stearoptene, m.p. 62·5°C. The odour of the yellow oil recalls that of lemongrass. It contains 20·8 per cent. of aldehydes; also lævo-limonene and geraniol.

Vetiver Oil. P. Genvresse and G. Langlois. (*Comptes rend.*, **135**, 1059.) When vetiver oil is subjected to redistillation with steam, only about one-third comes over. The residue, consisting of a viscous acid substance, appears to be derived, at least in part, by saponification, with water of an easily decomposed ester. The portion which distils is separable into two parts. The first portion is lighter, the second heavier than water. The light portion is found to consist mainly of a sesquiterpene, *vetivene*, $C_{15}H_{24}$, a mobile, colourless, odourless liquid with the sp. gr. at 20°C., 0·932; $[\alpha]_D = +18° 19'$. It boils at 135°C. under 15 Mm., and at 262–263°C. under 740 Mm. The heavy oil, after saponifying with alcoholic KOH, yields the alcohol vetivenol, $C_{15}H_{26}O$, a clear, viscous, odourless liquid with the sp. gr. 1·011 at 20°C.; $[\alpha]_D = +53° 43'$. It boils at 169–170°C. under 15 Mm. It acetylizes, and on dehydration forms a sesquiterpene, which is probably vetivene. The acid resulting from saponification is similar to that found in the non-volatile residue. This residue consists of a mixture of vetivenol and a colourless, viscous, amorphous acid, which turns brown on exposure to the air. Its salts are amorphous. The empirical formula of the silver salt appears to agree with $AgC_{15}H_{22}O_4$. The odourous principle of the oil appears to be an ester of this acid with vetivenol, which is very easily saponified, even by water. (Compare *Year-Book*, **1902**, 151.)

Volemite, Presence of in Primulaceæ. J. Bougault and G. Allard. (*Journ. Pharm. Chim.* [6], **16**, 528.) From the roots and rhizomes of *Primula grandiflora*, the authors have isolated a crystalline polyatomic alcohol, which was first named primulite, but has since been identified with volemite, $C_7H_{16}O_7$, found by Bourquelot in the fungus *Lactarius volemus*. The dried, coarsely powdered rhizomes and roots were boiled for 2 hours with 5 parts of alcohol 85 per cent. On cooling, the liquid was filtered and the residue pressed. After distilling off the alcohol,

the residual liquid was precipitated with basic lead acetate; the filtrate, evaporated to a syrupy liquid, deposited crystals of volemite on cooling, which were purified by recrystallization from boiling alcohol, 85 per cent.

The volemite thus obtained has the $[\alpha]_D + 20° 65'$; boric acid does not modify it, but borax increases its rotation to $[\alpha]_D = + 20° 83'$. Its ethyl acetyl melts at 206°C., and has the $[\alpha]_D - 36° 40'$. Its acetic ester melts at 62°C. The slight difference in characters observed between this volemite and that isolated by Bourquelot from *Lactarius volemus*, is attributed to the latter being contaminated with mannite. On purifying Bourquelot's volemite by several recrystallizations from alcohol, it is obtained pure, and is then identical with the volemite of *Primula*.

Volemite has been found by the authors in the roots of *Primula elatior* and *P. officinalis*, as well as in those of the red variety of *Primula* cultivated in gardens. The amount present is approximately 1·5 per cent. of the dry material.

Water, Detection of Traces of Ammonia in, by means of Diamidophenol. Manget and Marion. (*Annales de Chim. Analyt.*, **8**, 83.) Diamidophenol, or amidol, gives a yellow colour with ammonia solutions, which are much more intense in tint than those given with Nessler's reagent; the reaction is, moreover, more delicate. Amidol solution is therefore recommended as a substitute for Nessler's reagent in the colorimetric determination of ammonia in the analysis of waters and effluents.

Water-melon Seeds, Fixed Oil of. S. Woinarowskaja and S. Naumowa. (*Chem. Centr.*, **1903** [1], 41.) Water-melon seeds yield 21·4 per cent. of a semi-drying oil, having the following characters: Sp. gr., 0·925; Hehner number, 96·1; Koettstorfer number, 198; Riechert number, 0·4; Huebl number, 111·5; acetyl value, 4·7; Maumené number, 50·4°. The oil solidifies at −20°C.

Wines, Malaga and Teneriffe, Characters of. J. V. Riel. (*Pharm. Weekblad.*, through *Pharm. Zeit.*, **47**, 965.) These wines, which are being much used for certain pharmaceutical preparations, have the following characters: *Malaga wine.* Alcohol, 11·1–15·7 per cent.; extract, 14·0–23·8 per cent.; sp. gr., 1·032 - 1·081. These figures are the extremes of 53 various samples. *Teneriffe wine.* Alcohol, 15·7–18 per cent.; extract, 4·5–7·4 per cent.; sp. gr., 0·997–1·004. These are limits shown by 16 specimens of the wine.

Wood Pulp in Paper, Detection of. A. Kaiser. (*Chem. Zeit.*, through *Annales de Chim. Analyt.*, **8**, 36.) The reagent, amyl-sulphuric ether, is prepared by heating together equal volumes of pure amyl alcohol and sulphuric acid, until a slight evolution of SO_2 occurs. A drop of this, placed on the paper to be examined, gives rise to a red colour, passing from violet to deep indigo blue, according to the amount of wood pulp present. The reaction is due to the property of ligneous matter of forming furfural, which gives rise to the colour reactions indicated with amyl-suphuric ether.

Yohimbi Bark, Alkaloids of. P. Siedler. (*Pharm. Zeit.*, **47**, 797.) The so-called yohimbine, obtained by Spiegel from yohimbi bark, to which he attributed the formula $C_{22}H_{30}N_2O_4$ or $C_{23}H_{32}N_2O_4$, and which had the m.p. 231°C., or, according to Thoms, 234°C., is found by Siedler to be separable into two distinct bases by fractional crystallization from benzol. One of these melts at 231°C., and the other at 234°C. Siedler has isolated 4 distinct alkaloids from yohimbi bark, which differ from each other in solubility in alcohol, ether and chloroform.

Zinc and Cadmium Sulphides, Crystalline. G. Viard. (*Comptes rend.*, **136**, 892.) By passing the vapour of $ZnCl_2$ or of $CdCl_2$ in an atmosphere of CO_2 over heated SnS, double decomposition takes place, $SnCl_2$ is formed and volatilized, and the respective sulphide deposited in a crystalline form. ZnS thus obtained, occurs as long white or amber-coloured acicular prisms. CdS forms brownish or orange-red dendritic crystals, which are formed of hexagonal scales and prisms terminated with pyramids.

Zinc, Determination of, as ZnS. A. Thiel. (*Zeit. Anorgan. Chem.*, **33**, 1.) Precipitation is effected by adding an excess of H_2S solution to the neutral solution of the zinc salt, dissolved in a round-bottomed flask in the presence of a considerable quantity of ammonium acetate. The mixture is well boiled for a few minutes, when the precipitated ZnS quickly aggregates and settles. On standing, the greater part of the supernatant liquid is decanted and passed through a quick filtering filter-paper. If the substance examined be very impure, the ZnS may be purified either by boiling up once or twice with H_2S solution, and decanting, or it may be redissolved in HCl and reprecipitated. The ZnS is finally washed into a 50 c.c. Erlen-

meyer flask of Jena glass, evaporated to dryness on the water bath, removal of aqueous vapour being facilitated by the passage of a current of air through the flask. After adding the ash of the filter paper, the flask is dried at 120°C., and then cautiously heated to redness over an asbestos mantle, in a current of dry H_2S for about an hour, finally in dry hydrogen for a few minutes. The residue is allowed to cool in an atmosphere of the latter gas, and then weighed. The method is recommended for other metals which may be precipitated and weighed as sulphides.

Zinc, Presence of, in Potassium Chlorate. D. Vitali. (*Boll. Chim. Farm.*, through *Annales de Chim. Analyt.*, **8**, 39.) Attention is drawn to the fact that potassium chlorate obtained by the process of K. J. Baeyer may possibly be contaminated with traces of zinc. In this process chlorine is made to react on zinc oxide suspended in water, the zinc hypochlorite thus obtained being subsequently decomposed with potassium chloride. The potassium chlorate which is then crystallized out is liable to contain traces of zinc. When the salt is used in the course of toxicological testing to destroy organic matter, this trace of metallic impurity may easily lead to erroneous results. The impurity may be readily removed by treating a solution of the salt with ammonium sulphide, filtering, and recrystallizing.

MATERIA MEDICA.

PART II.

MATERIA MEDICA.

Acetanilide in Otorrhœa. (*Merck's Report*, **1902**, 2.) Three years ago acetanilide insufflations were recommended by G. F. Libby for the treatment of affections of the eyes and ears, especially in chronic otorrhœa. M. Melzi has recently applied this method to the treatment of chronic purulent otitis media of children, and is favourably impressed by its efficacy. After the first application the secretions lose their foetid odour, the discharge rapidly diminishes, and a complete cure is effected at a much earlier date than is obtainable with the customary methods of treatment. Melzi lays particular stress upon the necessity of carefully cleansing the auditory canal before applying the acetanilide. This is effected by swabbing out with several plugs saturated with hydrogen peroxide.

The insufflations should at first be applied daily, later on every other or third day.

Acetyl Chloride as Digestive Stimulant. G. D. Spineanu. (*Merck's Report*, **1902**, 3.) The nascent HCl which is liberated by acetyl chloride on contact with water, is found to act as a powerful stimulant to the digestive process in cases of defective acid secretion. Acetyl chloride is found to aid the digestive action of the gastric juice much more than an equivalent amount of dilute HCl, possibly the free acetic acid, which is formed simultaneously, also aids the peptic ferment in its action.

Aconite Roots, Indian. G. Watt. (*Agric. Ledger*, **1902** [3], through *Pharm. Journ.* [4], **16**, 63.) Since 1893 the author has been endeavouring to trace the botanical origin of the Indian aconites, by obtaining specimens of the roots and plants from all the northern provinces of India. These have been examined botanically by the author and Bruhl, and specimens of dried roots, plants, and seeds have been sent to the Royal Botanic Gardens at Kew and Edinburgh, and to the Museum and Herbarium

of the Pharmaceutical Society of Great Britain. But the seeds do not appear to have germinated. The Indian area of distribution is described as extending from Afghanistan, Baluchistan, Hazara, Kashmir, Kumain, Nepal, Sikkim, and Bhutan to the mountains of Assam, Manipur, and Burmah. No representative of the genus *Aconitum* occurs on the mountains of Central, Western, or Southern India.

NON-POISONOUS ACONITES. These include *A. heterophyllum*, Wall (Atis) and *A. palmatum*, Don (Wakhma) and two varieties, *A. multifida* and *A. rotundifolia*, hitherto referred to *A. napellus* (*Fl. Brit. India*, **1**, 29), but these, although said to be eaten by shepherds on the Alpine ranges, do not appear to be collected for commercial purposes. *Aconitum heterophyllum* has been examined chemically by Shimoyama and Warsewicz (*Pharm. Indic.*, App., 114–122), as well as *A. palmatum*, and both apparently yield the same alkaloid. Both are used as tonics, together with astringents, in diarrhœa and dysentery; but the roots are distinctly different in appearance. It has also been investigated by B. H. Paul, who obtained an alkaloid from some Wakhma root sent to the Pharmaceutical Society by the late Dr. Dymock, but beyond ascertaining that the base differed from aconitine nothing further was done with it.

POISONOUS INDIAN ACONITES. These include several plants which have been provisionally placed under *A. ferox*, Wall. Of these the var. *spicatum* is considered by the author to be the chief source of Nepal aconite. In 1897, however, Dunstan identified the var. *crassicaulis* (Nos. 7,037 and 7,038) as identical with the Nepal aconite of commerce. The identification of the plant with the root, so-called, is however, not quite certain at present. The variety *laciniatum*, which has an equally large root, is believed to be mixed with that of var. *spicatum* in Nepal aconite. The former root is probably the one (No. 6,812) that yields an alkaloid, found by Dunstan (*Agric. Ledger*, **1897** [19], 4), which does not exactly correspond with the properties of pseudoaconitine. But the occurrence of this root in the Nepal aconite of English commerce seems doubtful, since the professional aconite collectors of Nepal and Sikkim have no difficulty in distinguishing it, and even to European eyes the numerous and somewhat regular circular scars give a nodular appearance to the root which is characteristic of it. The variety *atrox* has a root that tapers very gradually to a long point, and on transverse section shows well-marked fibro-vascular bundles, each of an irregular,

flat, horseshoe shape, or sometimes elliptical, so arranged as to form a broad ring around a central pith, and occasionally a few isolated bundles within this ring. The variety *polyschizum* has similar roots to those of var. *atrox*, but smaller, with a single non-star-shaped ring of vascular bundles. This plant and the variety *atrox* differs so distinctly from *A. ferox* in the character of the root that they may probably be made a distinct species. The investigation of the Indian aconites has led Stapf to the conclusion that *A. napellus* does not exist in India at all. The two varieties, *multifida* and *rotundifolia*, referred to this species in the *Flora of British India*, **1**, 29, are non-poisonous, are different in structure, and will probably be referred to a different species. One of the Indian aconites, *A. rigidum*, Reichb., which occurs in Nepal, has leaves and flowers approaching those of *A. napellus*. It is figured by Wallich in his *Plant. Asiat. Rar.* t. 41, under the name of *A. ferox*, Wall, but the root apparently corresponds rather with that of *A. napellus* than with that of Nepal aconite. Another form, *A. dissectum*, Don, found also in Nepal, has leaves resembling those of *A. ferox*, var. *spicatum*. These two plants, *A. rigidum* and *A. dissectum*, Don, are considered to be the most promising of the Indian aconites for chemical investigation. Another form, *A. hians*, has a small root resembling in shape that of *A. napellus*, but shorter, being only about 1¼in. long; it is terminated by a short point. It was found by Dunstan to contain aconitine in smaller proportion than the European *A. napellus* (*Agric. Ledger*, **19**, 5). The structure resembles that of *A. napellus*, the fibrovascular tissue being arranged in a single star-shaped ring.

Alkaloidal Assay of Certain Drugs and their Preparations. H. Beckurts. (*Pharm. Post*, **18**, 67, through *Pharm. Journ.* [4], **16**, 267, 425). In the titration of alkaloids, iodeosin is used as the indicator as suggested by Schmidt and Partheil, with the exception of cinchona alkaloids, for which hæmatoxylin is recommended, iodeosin not answering the purpose in this case.

Aconite Herb. (*a*) *Extraction of the Drug by Redwood's Method; Alkaloids shaken out with Chloroform.* 20 Gm. of dried and powdered herb is extracted in a Soxhlet for 3 hours with 50 to 60 c.c. of a mixture of equal volumes of absolute alcohol and chloroform, the alkaloid transferred to dilute sulphuric acid and thence, after liberation with ammonia, to chloroform. The chloroformic solution is evaporated to dryness and the residue titrated.

Results: (1) 0·375; (2) 0·3882 per cent. of alkaloid.

(*b*) *Extraction as above; Alkaloids Shaken out with Ether-Chloroform* (*Schweissinger-Sarnow*). The method is similar to the above, but the final shaking out is effected with ether chloroform, half of which is evaporated to dryness and titrated.

Results: (1) 0·372; (2) 0·428 per cent.

(*c*) *Extraction with Acidulated Water; Alkaloids shaken out with Chloroform.* 20 Gm. of the same drug was mixed with 199 c.c. of water and 1 c.c. of dilute sulphuric acid and allowed to stand, with frequent shaking, for 20 hours in a loosely-corked flask in a warm place. After making good the loss by evaporation, 150 c.c. (=15 Gm. of drug) was filtered off and evaporated to 10 c.c. To this, strong alcohol was gradually added until the liquid measured 100 c.c. After 12 hours the liquid was filtered off, the residue washed, and the filtrate and washings evaporated to 10 c.c. Five c.c. of alcohol was then added, the alkaloid liberated by ammonia and shaken out with chloroform. The chloroformic solutions were evaporated to dryness and titrated.

Results: (1) 0·40545; (2) 0·44 per cent.

(*d*) *Digestion with Acidulated Water; Removal of the Alkaloids with Ether-Chloroform.* Similar to (*c*) but using 40 c.c. of ether-chloroform and evaporating one-half.

Results: (1) 0·3882; (2) 0·4313 per cent.

These results with aconite herb may be tabulated as follows:—

Process.	(*a*)	(*b*)	(*c*)	(*d*)
Yield of alkaloid (1)...	0·375	0·372	0·40545	0·3882
Yield of alkaloid (2)...	0·3882	0·428	0·44	0·4313

Keller found in aconite herb, 0·18–0·21; Schweissinger, 0·417–0·602.

Aconite Root. The methods employed were the same as those used for aconite herb. The process official in the German Pharmacopœia was also tried (*e*).

The results may be tabulated as follows:—

Process.	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)
Yield of alkaloid (1)	0·615	0·647	0·6642	0·625	0·621
Yield of alkaloid (2)	0·621	0·6125	0·7074	0·6146	0·640

Other investigators have found the following proportion of alkaloid: Hager, 0·6 to 1·24; Keller, 0·87 to 1·23; Cæsar and Loretz, 1·54; Merck, 1·28.

Extract of Aconite. Two processes for the assay of extract of aconite were tried, viz.: (*a*) Beckurts', and (*b*) Schweissinger's.

(*a*) *Beckurts' Method.* 2·5 Gm. is dissolved in 6 c.c. water and 6 c.c. of alcohol. 2 c.c. of ammonia is added, and the alkaloids shaken out with chloroform. The chloroformic solutions are evaporated to dryness, and titrated. Two different extracts yielded 3·1056 and 3·7785 per cent. of alkaloid respectively.

(*b*) *Schweissinger's Method.* 2 Gm. of extract is dissolved in 8 c.c. of water; 2 c.c. of ammonia and 40 c.c. of ether-chloroform are added and well shaken. 20 c.c. of the ether-chloroform solution is evaporated to dryness, and titrated. Two determinations gave 4·2702, and 4·85 per cent. of alkaloid. In extract of aconite Beckurts found 4·71 to 4·85 per cent. of alkaloid; Dieterich found 1·25 to 1·94 per cent.

Belladonna Leaves. Five processes of assay were tried, of which three (*a*), (*b*), (*c*) were the same as the corresponding processes for aconite leaves; (*d*) by percolation (Dunstan and Ransom); (*e*) Keller's process, modified.

(*a*) Results: (1) 0·50864; (2) 0·48263; (3) 0·47974; (4) 0·50575; (5) 0·51442 per cent. of alkaloid (calculated to atropine).

(*b*) Result, 0·4585.

(*c*) Result, 0·4932.

(*d*) *Percolation (Dunstan and Ransom).* 20 Gm. of dried and powdered leaves was percolated with a mixture of equal volumes of absolute alcohol and chloroform until rather more than 100 c.c. of percolate was obtained. This was then exhausted with acidulated water, the acid solution washed with chloroform, the alkaloids transferred to chloroform, which was then evaporated and the residue titrated.

Result: 0·4364.

(*e*) *Keller's Process, Modified.* 10 Gm. of the finely powdered leaves dried over lime is mixed with 90 Gm. of ether and 30 Gm. of chloroform. 10 Gm. of a 10 per cent. solution of soda is then added and the whole shaken for 3 hours. 10 c.c. of water, or sufficient to make the powder agglomerate, is next added, 60 Gm. of the ether-chloroform solution is filtered off, reduced by distillation to one-half and shaken with 10 c.c. of centinormal hydrochloric acid. Sufficient ether is now added, if necessary,

to make the ether-chloroform layer float, the acid liquid is separated, the ether-chloroform wash and the acid liquid and washings titrated.

Results: (1) 0·523; (2) 0·516 per cent. of alkaloid.

The results may be tabulated as follows:—

Process.	(a)	(b)	(c)	(d)	(e)
Yield of alkaloid . .	0·50864 0·48263 0·47974 0·50575 0·51442	0·4585	0·4932	0·4364	0·523 0·516

Belladonna leaves have been found to vary from 0·2–0·6 per cent. of alkaloid.

Belladonna Root. The processes are the same as those described under the corresponding letters for belladonna leaves:—

Process.	(a)	(b)	(c)	(d)	(e)
Yield of alkaloid . .	0·56644 0·58956 0·52309 0·5202 0·53465	0·5163	0·5319	0·5404 0·5316 0·53754	0·5433 0·5317

The following percentages of alkaloid have been found in belladonna root: Gerrard, 0·09–0·32; Kremel, 0·60–0·70; Redwood, 0·35–0·39; Keller, 0·66–0·67; K. Dieterich, 0·14–0·70; Cæsar and Loretz, 0·509–0·859.

Extract of Belladonna. The methods adopted were the same as those employed for aconite leaves. The results were practically identical, viz.: (*a*) 1·47968; (*b*) 1·46425 per cent. of alkaloid.

The following percentages of alkaloid have been found in extract of belladonna: Schweissinger-Sarnow, 0·786–1·040; Fischer-Hartwich, 1·8224; E. Dieterich, 0·86–1·62; K. Dieterich, 0·636–2·20; K. Dieterich, 0·93–1·21; Bischoff, 2·43–2·45.

CINCHONA BARK. (*a*) Three processes were tried, viz.: (*a*) Haubensak: (*b*) Keller; (*c*) Official German process.

(*a*) *Haubensak's Process.* 20 Gm. of dried cinchona bark in very fine powder is well shaken with 20 c.c. of alcohol, and 10 c.c. of 10 per cent. ammonia in a half-litre flask. 170 c.c. of ether is added, and the flask shaken occasionally for 2 hours. The ethereal solution is filtered, and 100 c.c. (= 10 Gm. of bark) shaken out with acidulated water. From this the alkaloid is transferred, after liberation with soda, to chloroform. The chloroformic solutions are evaporated to dryness and weighed. To obtain good results the drug must be in very fine powder.

Results: Red bark gave 6·935, 7·22, 6·84, 7·335 per cent. of alkaloid; crown bark gave 2·965, 2·925 per cent.

(*b*) *Keller's Method.* 12 Gm. of dried bark in very fine powder is shaken for several minutes with 40 Gm. of chloroform and 80 Gm. of ether; 10 c.c. of ammonia is then added, and the whole vigorously shaken at intervals during an hour. 10 Gm. of water is next added, and, on shaking again, the bark agglomerates so that 100 Gm. (= 10 Gm. of powder) can be poured off through cotton wool. The alkaloids are shaken out with 50 c.c. of water and 2 c.c. of dilute sulphuric acid, liberated with ammonia and extracted with chloroform-ether (3 : 1). The alkaloidal solution and washings are filtered into a tared flask, evaporated to dryness, and weighed.

Results: Red bark, 7·040; 7·19; 7·09; 6·905; 6·97 per cent. Crown bark, 2·944; 3·001 per cent.

(*c*) *German Official Method.* This process gave results identical with those by Keller's process, but the titration with hæmatoxylin is not to be recommended, it being practically as easy to weigh the alkaloids, and the small proportion of impurity becomes negligible in comparison with the quantity of alkaloid weighed.

AQUEOUS EXTRACT OF CINCHONA. Five processes were tried, viz.: (*a*) Beckurts; (*b*) Schweissinger-Sarnow; (*c*) E. Dieterich; (*d*) Official German.

(*a*) *Beckurts' Method.* Two Gm. of the extract is dissolved in 5 c.c. of water and 10 c.c. of alcohol, 5 c.c. of ammonia added, and the alkaloids shaken out with chloroform. The chloroformic solutions are evaporated to dryness at 100°C., and weighed.

Results: 7·525; 7·775; 7·920; 7·475; 7·45.

(*b*) *Schweissinger-Sarnow's Method.* 2 Gm. of extract is dissolved in 8 c.c. of water and the alkaloids liberated with 2 c.c. of 20 per cent. ammonia and shaken out with 40 Gm. of ether-chloroform (1 : 1). One-half of the ether-chloroform is removed, evaporated to dryness at 100°C., and weighed.

Results: 6·4; 6·2 per cent.

(*c*) *E. Dieterich's Method.* 2 Gm. of the finely-powdered extract is mixed with 3 c.c. of distilled water, and 10 Gm. of powdered quicklime added; the crumbly mass is at once extracted with ether for 6 hours in an extraction apparatus. The ethereal solution is evaporated to dryness, and weighed.

Results: 5·9; 6·625.

(*d*) *Official German Process.* Results: 6·6; 6·9; 6·82; 6·3 per cent.

HEMLOCK HERB. Two methods were employed, viz: (*a*) digestion with acidulated water and shaking out with ether-chloroform, and (*b*) extraction with alcohol and shaking out with ether-chloroform.

(*a*) *Process Similar to that Described under Aconite Herb* (*c*). From the final small quantity of aqueous solution the alkaloid is liberated by potassium carbonate, and transferred to ether-chloroform, an aliquot portion of which is removed, shaken with a measured quantity of decinormal hydrochloric acid, and the excess of acid determined by centinormal soda.

Results: 0·0402; 0·0317; 0·03386 per cent.

(*b*) 20 Gm. of powdered herb is exhausted in a Soxhlet with 75 c.c. of alcohol. The solution is evaporated to a small bulk, mixed with water, filtered, and the alkaloids transferred by potassium carbonate to ether-chloroform, an aliquot portion of which is treated as detailed in (*a*).

Results: 0·03175; 0·0349 per cent.

EXTRACT OF HEMLOCK. Two processes were employed, viz.: (*a*) Schweissinger-Sarnow, and (*b*) E. Dieterich.

(*a*) Two Gm. of extract is dissolved in 8 c.c. of water, the alkaloids liberated with 1 Gm. of potassium carbonate, transferred to 40 c.c. of ether-chloroform (1 : 1), an aliquot portion of which is treated as directed under aconite herb.

Results (in 2 different extracts): (1) 0·635; (2) 0·4953 per cent.

(*b*) 2 Gm. extract is dissolved in 3 c.c. of water, mixed with 10 Gm. of powdered quicklime, and exhausted with ether. To the ethereal solution 5 c.c. of decinormal acid is added, the ether

removed by distillation, the residue diluted and titrated with centinormal soda.

Results: (1) 0·6604, 0·6985; (2) 0·4826, 0·4953.

Henbane Herb. The processes employed were the same as those adopted for belladonna. The results of various assays of the same drug may be tabulated as follows:—

Process.	(a)	(b)	(c)	(d)
Yield of alkaloid...	0·07803	0·08862	0·0771	0·09826
" " ...	0·09537	0·07321	0·07128	—
" " ...	0·0867	—	0·0722	—
" " ...	0·08959	—	—	—

Our knowledge of the percentage of alkaloid in henbane is very deficient. Particularly noticeable are the high percentages found by Schmidt (lamina, 0·2762, 0·2861; petiole, 0·363, 0·365); and Cæsar and Loretz (2·625, 2·687, 2·019!!). These high percentages are quite inconsistent with the doses of the galenical preparations as compared with the alkaloidal content and doses of the corresponding preparations of belladonna.

Extract of Henbane. (*a*) *Beckurts' Method.* Two different extracts yielded 0·8092 and 0·786 per cent. respectively.

(*b*) *Schweissinger-Sarnow's Method.* A purchased extract gave 1·0982 per cent.

(*c*) *Official German Process.* Various extracts gave 0·92; 0·99; 1·00; 0·583; 0·56 per cent.

Ipecacuanha. Three methods were employed, viz.: (*a*) Keller's, and (*b*) extraction with chloroform and alcohol as for aconite herb (*a*), and (*c*) the German official process.

(*a*) *Keller's Method with Final Titration of the Alkaloids:*
Results with four samples of the Brazilian drug:

(1)	(2)	(3)	(4)
2·2352	2·390	2·106	3·397
2·24536	2·309	2·006	2·370
2·174	2·3876		
2·194	2·2656		

Results from 3 samples of the Carthagena drug, viz.: (1) Selected extra large roots; (2) medium sized roots; (3) drug as imported.

(1)	(2)	(3)
2·086	1·903	2·513
2·045	1·944	2·557

Results with the Singapore drug:

(1) 2·086.
2·106.

(b) *Process as for Aconite Herb* (a). 4 assays of 1 sample gave 2·286; 2·2606; 2·3368; 2·3114 per cent.

(c) *German Official Method.* Results: 2·2; 2·25; 2·19; 2·1 per cent.

In this method caustic soda is employed to liberate the alkaloids; this results in the loss of part at least of the cephaeline; the results are therefore too low.

In the method recommended by G. Frerichs and N. de Fuentes Tapis (*ante*, 97), the alkaloids emetine and cephaeline are liberated by sodium carbonate; psychotrine, not being freed from its combination by this alkali, escapes determination, and the results are slightly (about 0·05 per cent.) too low.

Nux Vomica. (a) *Percolation with Dilute Alcohol.* 10 Gm. of powdered seeds was exhausted in a percolator with dilute spirit, and the percolate evaporated to a thin extract; this was dissolved in a mixture of 10 c.c. of alcohol, 5 of water and 5 of ammonia, and the alkaloids shaken out with chloroform. The chloroformic solutions were evaporated to dryness and titrated, under the assumption that the alkaloid consisted of strychnine and brucine in equal proportions.

Results: 2·395; 2·38 per cent.

(b) *Digestion with Dilute Alcohol.* Instead of percolation, digestion for 24 hours in a warm place, and filtration of an aliquot portion was adopted.

Results: 2·2568; 2·271; 2·125; 2·06752 per cent.

(c) *Keller's Method.* Results: 2·1112; 2·184; 2·1694; 2·2568 per cent.

(d) *Official German Process.* Results: 2·08; 2·2; 2·19; 2·12 per cent.

The following percentages of alkaloid have been found: Dunstan and Short, 3·15–5·34; Kremel, 1·84–2·76; Beckurts, 2·176–2·384; Keller, 2·64–2·885; Landor, 2·73–3·13.

STRAMONIUM LEAVES. The first 4 methods employed are the same as those described under the corresponding letters for aconite herb.

(*a*) Result: 0·3179 per cent.
(*b*) Result: 0·3083 per cent.; 0·3198 per cent.
(*c*) Result: 0·3622 per cent.; 0·393 per cent.
(*d*) Result: 0·3323 per cent.; 0·3382 per cent.
(*e*) Keller's method. Result: 0·375 per cent.

The following percentages of alkaloid have been in stramonium leaves: Schweissinger, 0·225–0·319 per cent.; E. Schmidt, 0·4 per cent.

Anæsthesine. (*Merck's Report*, **1902**, 20.) Para-amido-benzoic ethyl ester, $C_6H_4\left\langle\begin{matrix}NH_2\\COOC_2H_5\end{matrix}\right.$, or anæsthesine, is a white tasteless powder, sparingly soluble in water, which has been introduced as a local anesthetic. It is freely soluble in oils and fats, also in alcohol and chloroform. It is given internally in painful affections of the stomach, in the form of powder, in doses of 3–8 grains, taken 3 times daily. It is applied locally in the form of a 5 or 10 per cent. lanoline ointment to allay itching in various skin diseases. A spray for the throat before superficial operations may be obtained by dissolving anæsthesine 3, in alcohol 90 per cent. 45, and adding water 55. A preferable method is to apply with a brush a 30 per cent. suspension of anæsthesine in mucilage or to insufflate the powder. Anæsthesine would not appear to substitute cocaine, since it does not produce painlessness deep in the tissue.

Anæsthesine hydrochloride has also been employed, since it is more soluble than the above. It is used by subcutaneous injection in the following solution; Anæsthesine hydrochloride, 25 Cgm.; morphine hydrochloride, 5 to 15 Mgm.; physiological salt solution, 100 c.c. Dissolve and sterilize.

Preparations of anæsthesine are also known as "cocainol."

Aphthisin. (*Pharm. Post*, **35**, 425.) A compound of potassium guaiacol-sulphonate and petrosulphol has been introduced in catarrhal and tuberculous affections of the lungs and in chronic bronchitis. It forms a brown, very hygroscopic powder, soluble in 4 parts of water. On account of its hygroscopic nature it is best administered in the form of capsules, or as the following syrup: Apthisin, 18; syrup of orange peel, 90; simple syrup, 180; compound tincture of cinchona, 15. A teaspoonful of this may be

taken 3 or 4 times a day, or one capsule containing 4 grains of aphthisin may be taken at similar intervals.

Apocodeine as a Laxative. W. E. Dixon. (*Brit. Med. Journ.* **1902** [2181], 1247.) The author confirms the statement of Toy and Combemale as to the aperient action of apocodeine hydrochloride. It lowers the blood pressure, dilates the blood vessels and stimulates peristalsis, probably through a sedative action on the inhibitory ganglia of the sympathetic. When given hypodermically in suitable doses, it does not give rise to vomiting or nausea, but is a useful aperient. The hypodermic dose is 2 c.c. of a 1 per cent. aqueous solution. It should be preserved in a non-actinic bottle.

Arheol. Riehl. (*Pharm. Centr.*, **44**, 81.) This alcohol, $C_{15}H_{26}O$, is said to exist in commercial sandal oil in quantities varying from 30–90 per cent. It is stated to have the same therapeutic action as sandal oil, but to be without any disturbing effects on the renal functions. It is, in fact, considered to be the active principle of sandal oil. It is an oily, colourless liquid, which is prescribed with success in gonorrhœa in the form of capsules containing 3 grains, 10 or 12 of which may be taken daily. [This is probably a fancy name for the alcohol santalol.—Ed. *Year-Book.*]

Aristolochia cymbifera. S. Butte. (*Merck's Report*, **1902**, 174.) Some confusion appears to have arisen as to the application of the term "guacho" by Butte to the root of *Aristolochia cymbifera*, indigenous to Brazil and Paraguay, whereas guacho is a Mexican plant and derived from *Aristolochia fragrantissima.* The author, however, expressly states that the drug he has examined is derived from *A. cymbifera.* It is found to produce paralysis of the sensory nerve centres, and is therefore indicated in all cases of irritation of those nerve centres, such as itching from various morbid causes. In France a preparation of guacho has been introduced under the name of "Nisaméline," which is claimed to allay itching and neuralgia, both when applied locally and when taken.

Arsenic, Organic Compounds of, Employed in Therapeutics. (*Journ. Pharm. Chim.* [6], **16**, 445.) *Sodium cacodylate.* A mixture of $KC_2H_3O_2$ and As_2O_3 is distilled, which yields a fuming distillate composed of cacodyl, $(CH_3)_2As.As(CH_3)_2$, and cacodyl oxide, $(CH_3)_2AsO.OAs(CH_3)_2$. This is then oxidized, by shaking

it under water with HgO, when cacodylic acid, $(CH_3)_2AsO.OH$, is obtained. Contact with air must be avoided while conducting this part of the process, since cacodyl and its oxide are spontaneously inflammable. The cacodylic acid, which is dissolved in the water, is then neutralized with sodium carbonate and crystallized after evaporation. The salt occurs in crystals, which differ markedly in appearance, according to the temperature at which it has been crystallized. It may contain from 1–3·5 molecules of water of crystallization. The commercial salt is generally a mixture of several hydrated forms.

Potassium cacodylate, $(CH_3)_2AsO_2K + xH_2O$, occurs in white crystals, soluble in water, insoluble in alcohol.

Calcium cacodylate, $[(CH_3)_2AsO_2]_2Ca + xH_2O$, is a white powder, soluble in water.

Magnesium cacodylate is extremely soluble.

Lithium cacodylate, $(CH_3)_2AsO_2Li + xH_2O$, is a white powder, soluble in water.

Quinine cacodylate is a white powder, more soluble in cold than in hot water.

Iron cacodylate is a pale green powder, soluble in water. It is chiefly employed in the form of hypodermic injections; it has given excellent results in chlorosis.

Mercury cacodylate, in brilliant prisms, is soluble in water. Employed for syphilis in hypodermic injections.

Guaiacol cacodylate or *cacodyliacol*, $As(CH_3)_2O_2.C_6H_4.OCH_3$, is a molecular combination of guaiacol and cacodylic acid. It is split up, on contact with water, into its constituents.

Cinnamyl cacodylic acid, $C_6H_5.CH : CH.COOH.AsO(CH_3)_2.OH$, is an unstable compound at once decomposed by water.

Arrhenal; di-sodium methyl-arsenate, $CH_3AsO_3Na_2 + 6H_2O$. This occurs as bulky transparent colourless crystals. It is employed in similar cases as the cacodylates, but in larger doses, which are considered more effective. Its solutions give rise to less pain than those of the cacodylates when injected hypodermically. The following reactions serve to distinguish sodium cacodylate and arrhenal: To litmus, arrhenal is alkaline, sodium cacodylate neutral. With $AgNO_3$ and with $Pb2C_2H_3O_2$ arrhenal gives white precipitates; sodium cacodylate is not precipitated. With $Hg2NO_3$ arrhenal gives a white precipitate; cacodylate the same at first, then turning yellow. With $CaCl_2$ arrhenal is unaffected in the cold, but on warming throws down a white precipitate; sodium cacodylate gives no precipitate even on warming. Arrhenal

gives a violet precipitate with Co_2NO_3; cacodylate none. The reaction with $CaCl_2$ is specially delicate. (See also *ante*, p. 44.)

Histogenol is a mixture of arrhenal and nucleinic acid derived from fish roe.

Calcium glycero-arsenate. This salt, prepared in a similar manner to calcium glycerophosphate, substituting arsenic acid for phosphoric, has been suggested for use in arsenical treatment (*Year-Book*, **1901**, 52 and 164).

Atoxyl. Under this name the anilide of metarsenic acid, $C_6H_5NHAsO_2$, has been introduced. It is a crystalline, odourless, and tasteless powder of relatively low toxic power.

Atropine Methyl Bromide. (*Merck's Report*, **1902**, 30.) This new substitution product of atropine,

$$C_{16}H_{20}O_3 = N \begin{cases} CH_3 \\ CH_3 \\ Br, \end{cases}$$

appears to have the valuable physiological properties of the base from which it is derived, without its undesirable secondary reactions. It occurs in white crystals, m.p. 222-223°C., which are readily soluble in water or dilute alcohol. It affects the heart and respiration far less than atropine. Two drops of a 1 per cent. solution produce as prompt and as satisfactory mydriasis as atropine, when applied to the eye. It is, however, not so persistent, rapidly passing off, whereas with atropine the mydriasis and accompanying paresis of the accommodation persist for 2 or 3 days. Atropine methyl bromide is a suitable substitute for homatropine, or, when combined with cocaine, for euphthalmine, which has hitherto been regarded as the only mydriatic which does not give rise to paresis.

Internally, atropine methyl bromide is as effective an anhydrotic as atropine. It may be prescribed in pills thus: Atropine methyl bromide, 2 grains; powdered licorice root, 38 grains; extract of licorice, q.s. to mass. Divide into 20 pills. 1 or 2 to be taken at night.

Externally it is used to produce mydriasis in the form of a 1 per cent. solution or combined with cocaine hydrochloride thus: Atropine methyl bromide, 1 Gm.; cocaine hydrochloride, 2 Cgm.; distilled water, 200 Gm.

Atropine Methyl Nitrate; Eumydrine. (*Pharm. Zeit.*, **48**, 324.) The name eumydrine has been applied to atropine methyl nitrate. It is used as a mydriatic, for which purpose it is stated to be very

effective. In its modified therapeutic properties it resembles atropine methyl bromide.

Beeswax, Effect of Bleaching on the Constants of. R. Berg. (*Chem. Zeit.* **1902** [26], 605, through *Analyst*, **27**, 300.) All processes of bleaching increase the acid number of beeswax, the natural method least, treatment with chromic acid most of all. Ordinary bleaching and permanganate leave the ester number unchanged, or slightly raise it; chromic acid always lowers it. The increase of the acid value is invariably so great as to lower the ratio; and without a qualitative analysis the bleached wax might be thought to be adulterated with stearin. The saponification value of bleached wax is also always a trifle higher than that of yellow wax. The influence of bleaching upon the iodine value is peculiar; contrary to expectation, treatment with chromic acid usually raises it; but Italian waxes exhibit a lower iodine absorption after any method of bleaching. The Buchner number is lowered a little by natural bleaching or by permanganate; chromic acid raises it, sometimes considerably. The Buchner number of Italian wax, however, falls during bleaching. Bleaching by the ordinary process, or by permanganate, does not affect the rotatory power of the wax, or has a tendency to increase it; but treatment with chromic acid, or any method of bleaching Italian wax, reduces the optical activity. Chromic acid frequently raises the melting point notably; other processes lower it a trifle.

Benzoyl-acetyl-peroxide as an Intestinal Disinfectant. P. C. Freer. (*Chem. News*, **87**, 112.) Dysentery and other intestinal diseases, due to the presence of pathogenic organisms, may be advantageously treated with benzoyl-acetyl-peroxide, in 4 grain doses, enclosed in gelatin capsules, coated with 2 layers of celloidin. Although the peroxide itself is inert, its products of hydrolysis have most powerful germicidal properties, so that a dilution of 1 : 3,000 kills most living bacteria in 1 minute. In bactericidal action its aqueous solutions compare favourably with relative stronger solutions of hydrogen peroxide or of phenol. It is stated to be perfectly harmless.

Bismuth, Therapeutic, the Action of. G. Fuchs. (*Deut. med. Woch.*, through *B.M.J. Epit.*, **1903**, 104.) Since the value of bismuth in the treatment of gastric ulcer is undisputed, it is a matter which has interested many investigators as to how it exerts its action. Some believe that it does good in mechancially protecting the ulcer, while others assign a specific action to it. G. Fuchs has studied the question, and found that mixtures of bis-

mutose in distilled water, when exposed to the light, change in colour to grey, and later to black. This reduction, he found, takes place in the stomach of dogs, and he comes to the conclusions that: (1) Calcium carbonate, magnesia usta, and like chemicals, are not capable of being substituted for bismuth in the treatment of gastric ulcer; (2) the secretion of mucus after the introduction of bismuth subnitrate is not due to the mechanical action of the crystals, but is due to a specific action of the salts of bismuth; (3) the curative action depends on the reduction of the bismuth salt, and the reduced bismuthous salt penetrates into the granulation tissue, and forms a protective to it; (4) bismutose appears to be the most useful preparation of bismuth on account of its easy reducibility.

Bismutose. H. Reinhardt. (*Pharm. Zeit.*, **47**, 637.) A combination of bismuth and albumin, known under this name, is obtained by precipitating white of egg with bismuth nitrate in a saturated solution of common salt. The precipitate obtained is washed until quite neutral, dried with gentle heat, and powdered. It forms a fine, odourless, tasteless, non-clotting powder, containing about 21 per cent. of its weight of bismuth. It gradually becomes slate grey and even black on exposure to light, but the decomposition is only superficial. It may readily be sterilized, since it is unaffected by a temperature of 130–140°C. In contact with much water it swells considerably; it will absorb 3 or 4 times its weight of water without becoming apparently wet and without aggregating; if agitated with water it forms a milky, very persistent emulsion. It is not acted on by pepsin; pancreatin, in the presence of dilute alkalies, has a slight action on it. It is free from any toxic properties, and may be given in large doses. It is given as an intestinal astringent and disinfectant.

Bromelin, the Digestive Enzyme of Pineapple Juice. (*Journ. Frank. Inst.*, through *J.S.C.I.*, **21,** 1347.) Bromelin, the digestive ferment of pineapple juice, is similar to pepsin in its digestive action and is very powerful, operating in alkaline, acid, or neutral media. It will digest 1,000 times its weight of proteids in a few hours. Fibrin disappears under its influence entirely, after a time; coagulated egg albumin is slowly digested, while meat albumin is converted into a gelatinous mass, which soon dissolves. Bromelin may be precipitated from pineapple juice by means of common salt.

Bromocol. Joseph. (*Merck's Report*, **1902,** 36.) A 10

per cent. solution of bromocol is prepared by means of borax; this is known as soluble bromocol. Of this soluble bromocol, 5 to 10 parts are mixed with zinc oxide and starch, of each, 20; glycerin, 30 fluid parts; and water to produce 100. This forms an emulsion which readily sets when applied to the skin. It is useful in eczema and other cutaneous eruptions. A 10 per cent. resorbin ointment of bromocol is recommended by Ljanz for application to itching piles.

Bromocol has been found useful internally in epilepsy, in doses of 135 grains three times a day, increased to 300 or 480 grains. Nervous headaches are relieved by doses of 8 grains. (Compare *Year-Book*, **1901**, 136; **1902**, 163.)

Bryonia Alba as a Hæmostatic. (*Merck's Report*, **1902**, 61.) Pedresco finds that the alcoholic extract of *Bryonia alba* root, in addition to its well-known purgative and emetic action, is also a useful uterine hæmostatic in metrorrhagia. It is best given in the form of pills containing 1¼ grains of the alcoholic extract massed with powdered licorice root. 5 of these should be taken 4 times a day. It is also an efficient remedy in epistaxis and in hæmoptysis.

Calcium Peroxide (Gorite) as an Intestinal Disinfectant. (*L'Union Pharm.*, **43**, 455.) Nencki, in 1898, found that CaO_2 was an efficient disinfectant of the intestinal tube. Karuzas and J. Zaleski have shown that it is quite harmless, and that its administration is followed by a marked lessening of the amount of indican and sulphur acids in the urine. Roszowski has employed it with marked success as a disinfectant in the various digestive maladies of infants. It was given in doses of 8–16 grains in 24 hours. In 1 or 2 cases vomiting was observed, which disappeared on lessening the dose. Apart from this, no ill effects followed the administration of the drug.

Calcium Sulphate in Phosphaturia. J. Etterlen. (*Merck's Report*, **1902**, 40.) Calcium sulphate in doses of 24–30 grains per diem has been found to be very efficacious as a remedy for phosphaturia. It is free from any injurious effect on the digestive organs. It is prescribed in the form of a cachet, each containing 7½ grains, with an equal quantity of magnesium carbonate. One such cachet is taken 3 or 4 times daily before meals.

Cannabis indica, Further Notes on. E. M. Holmes. (*Pharm. Journ.* [4], **15**, 129. Compare *Year-Book*, **1902**, 167.) *Guaza* is the term applied by drugbrokers in this country to the ganjah which comes from Bombay, which is inferior in quality to that

from Calcutta, the heavy duty on the latter preventing its competition with the Bombay drug.

Bhang consists of the selected leaves of the plant, dried and broken up into coarse powder, the leaves being obtained from plants that are not carefully manured or cultivated, as they are for ganjah. The lower leaves, often soiled and inert, are avoided, and the flowering tops are not necessarily added. For good qualities the leaves are collected at the right time, when the resin is most abundant, and the leaves of male plants are not taken, nor are those of non-resinous female plants.

Haschisch. The word, which literally means "the plant," is used in Syria, Turkey, and Egypt to indicate bhang, churrus, and also alcoholic preparations of the plant.

Mdjún is a term applied to a sweetmeat or confection, of which Indian hemp is the basis, but it may contain nux vomica, opium, cantharides, or frequently datura seeds, according to the purpose for which it is intended, whether as an aphrodisiac or a criminal excitant or deliriant.

Charas, or *Churrus*, is the resin obtained from the flowering tops, collected in different ways in different districts. It forms a greenish-brown, moist resinous mass containing 22–25 per cent. of vegetable *débris*. It is obtained chiefly from cultivated female plants.

Gánjá. This is the most important preparation of the plant from the point of view of medicine and pharmacy. It is obtained exclusively from highly cultivated plants, and consists of the flowering tops of the female plant deprived as much as possible of leaves. Two kinds of ganjah are prepared, one called "cháptá," or flat, and the other "goli," or round. For the former the large leaves of the stem and branches are removed, and also, as far as possible, the small leaves of the twigs close to the flowering tops, and it is by the relative freedom from these that the ganjah dealer judges to a great extent of the value of a sample. The crop does not ripen all at once, so that the most advanced plants are selected, and only enough to be dried during 2 days is cut at one time. The plants are cut at 9 o'clock in the morning, about 6 inches from the ground, and are spread out in the sun. They are sorted in the afternoon, and are cut into lengths of 2 or 2½ feet, left till the following afternoon, and then collected into bundles of equal size, and stacked in layers on matting, the heads inwards and overlapping in a circle. As the plants are laid on the mat a number of men trample them flat, fixing the bundle with one foot, and

flattening the tops with the other. Fresh layers are added until the stack is about 15 inches high and consists of about 4 or 5 layers. The whole is then trampled on for half-an-hour, after which it is covered with matting and compressed still further by the men sitting upon the matting for about half-an-hour. The bundles are then taken up in pairs and beaten together over a mat to shake off broken leaves and seeds, and are then trampled again and the process of beating repeated, and finally they are laid on the grass and covered with mats till the next morning, when the process is repeated, until the flower tops are hard and firm. The bundles with the heads inward are then made into bales, about 3 feet long, 1 foot 8 inches across, and 5 feet 8 inches round. These bales form "large flat" ganjah. Or the stems may be broken into twigs about 1 foot long, and tied loosely into small flattish bundles such as could be grasped in both hands and weighing about a quarter of a seer each. These are packed in bales which, like the former, weigh a maund each, but are only about 1 foot 8 inches long, 2 feet across, and 6 feet 6 inches round. This form is known as "flat twig."

The "goli," or round ganjah, is prepared with greater care. It is always less leafy than flat ganjah, the final dressing for removal of the leaf being done by hand. The plants are reaped in the afternoon and laid out on level ground previously freed from weeds and stubble, till next morning, when they are sorted and left till noon. The bundles are rolled in the following manner: A long bamboo is firmly tied horizontally to a row of strong posts, mats being spread on each side of this bar, and a number of men in a row along each mat lay hold of the bar for support, pressing and rolling the bundles with their feet. After about 10 minutes the leaves are shaken off and the bundles exposed to the sun for about 20 minutes, and rolled again with the feet for a shorter time, after which the men sit down, and press and roll the twigs as hard as possible with their hands. The twigs are then separated and exposed to the sun for half-an-hour, and the process repeated late in the afternoon; the twigs are then tied in large bundles and covered for the night. The next day, after exposure to the sun and pressing and rolling if necessary until quite dry, which usually has taken place by 2 o'clock, the twigs are sickle-trimmed to remove as much woody stem as possible, and made into bundles of 6–9 inches in length, whose girth is the grasp of one hand with the breadth of the other, and whose weight is approximately a quarter of a seer. These bundles are packed, heads inwards, into bales

that weigh a maund, and are about 1 foot 1 inch thick, 2 feet 2 inches across, and 7 feet 6 inches round. Only about one-fifth of the crop is made into round ganjah.

In the process of rolling and beating some of the heads get detached. These are sold separately under the name of chúr. The "flat twig" yields about 8½ per cent. of chúr, and the round 15 per cent. of broken ganjah or chúr. It is exported in bags containing a maund. These bags are 3 feet high, 1 foot 6 inches across, and 5 feet round. The chúr of the flat twig sells readily: that of round ganjah is the perquisite of the buyer.

Ganjah is considered to be about 6 to 10 times stronger than bhang, but is much weaker than churrus, for whereas ganjah yields only about 25 per cent. of resinous powder, churrus yields 75 per cent., and only 25 per cent. of inert matter. In India ganjah and churrus are rarely taken internally, but are smoked.

In some districts where there is much rain during harvest time fire-drying obtains, but the ganjah so prepared is darker in colour, and as the colour is considered by the purchaser as an index to the quality of the drug, the fire-dried ganjah does not command a ready sale. According to Prain's experiments, the hemp plant yields on an average 3 ounces of ganjah and 0·6 Gm. of resin. Of this resin 8–10 per cent. adheres to the feet and hands of the men who prepare the ganjah. This, in Bengal, is not saved to form churrus, but is scraped off and thrown away.

In India ganjah and churrus are used for smoking. Bhang or siddhi is not. The habit of smoking ganjah becomes part of a man's life. Under ordinary circumstances he has his smoke daily when his day's labour is over, and during the interval when he cooks his evening meal. Under extraordinary circumstances he takes it to sustain him in the midst of severe or prolonged exertion. It does not (as opium smoking does) affect his appetite, but enables the poorest to partake with a heartier appetite of their somewhat uninviting fare. It does not affect digestion or interfere in the slightest degree with bodily or mental health, and the habit does not grow upon the votary. Ganjah smoking appears to be only injurious when indulged in to excess by those who lead sedentary lives.

Ordinarily about 5 grains of ganjah and 5 or 10 of tobacco are smoked at a time. A few whiffs, usually 3 only, are taken during a tiring march or at the end of a long day's journey, and are said to produce a feeling of comfort and to relieve sensation of weakness, depression, or cold. Those who wish to produce a con-

dition of frenzy, as religious mendicants do, smoke from 15–60 grains, and repeat it frequently during the day. Bhang, or siddhi (i.e., "the success giver," as it is more commonly termed in Bengal) is more usually taken in repeated doses to produce this effect. The usual dose is ½–2 tolas of siddhi. The leaves are washed and pounded and made into a thin paste, and drunk; dill, pepper, or some reputed digestive being added. For purposes of intoxication the dose is probably increased to 3 or 5 tolas. The internal administration of bhang appears to have a much more injurious action on the digestive system than the smoking of ganjah.

Churrus, curiously enough, does not seem to be made in Central India. It is prepared in Himalayan and trans-Himalayan countries. In the Punjaub and Nepal it is collected by hand from unreaped plants. In Ladak, Yarkand, and Turkestan by beating reaped plants upon coarse cotton cloths, to which the resin adheres. In Thibet and the greater part of Turkestan it is said to form at first a greenish-white powder (but this is not the case in Bengal), which is stored in bags, in which it gradually agglutinates. In the neighbourhood of Herat and in Persia the substance collected on the cloths is sometimes melted into a homogeneous mass by means of warm water, and is squeezed through the cloth, the Herati charas being consequently purer than the Ladaki, which contains more vegetable *débris*. Charas is also said to be made in Greece, but whether on the mainland or on the islands of the Greek Archipelago is not known. The classical account of churrus implies that it is produced in Central India, but inquiries made by Prain show that it is not so.

The curious story of its being obtained by natives rushing through the hemp fields, and the resin being scraped from their leather jerkins or naked (oiled) bodies is difficult to trace to its origin. Inquiries made by Prain in Central India and Nepal, and subsequently in Scinde and Beluchistan, proved that it was not so collected in any of these districts, but the curious fact came out that the people of the latter two countries used ganjah as a narcotic, but the ganjah proved to be not Cannabis at all, but a Hyoscyamus. In any case it is not likely that naked men, with oiled skins, could collect much churrus in that way, nor that leather jerkins would be used, and it would be extremely interesting to know how such an account originated.

Carbol-lysoform. Elsner. (*Duet. med. Woch.*, through *B.M.J. Epit.* **1902** [2], 91.) This is a mixture of 2 parts of crude phenol with 1 part of lysoform. It is claimed for the mixture

that although less toxic, it equals the same amount of pure phenol in germicidal power, and is more active than lysoform alone. It is free from the objectionable odour of carbolic acid.

Castela nicholsoni Bark and Twigs. (*Merck's Report*, **1902**, 172.) The bark and young shoots of *Castela nicholsoni*, N.O. Simarubaceæ, indigenous to Texas, and locally known as "Chaparro amargoso," "bisbi," or "amargosa," furnishes an intensely bitter drug, which is highly esteemed as a tonic and antiperiodic. It is also astringent and antiseptic, and is regarded as a specific in diarrhœa and dysentery. The fluid extract of the bark has been employed in the treatment of acute and chronic dysentery, in doses of 15–130 minims per diem. The active principles of the drug would probably repay investigation.

Cativo. E. M. Holmes. (*Pharm. Journ.* [4], **15**, 296.) A consignment of a viscid oleo-resin, exported from Columbia under the impression that it resembled copaiba, has reached the London market. It is derived from *Prioria copaifera*, Grisb., which is closely allied to the genus *Copaifera*. No information is available as to its use. J. C. Umney has examined the drug, and reports as follows: "It forms a yellowish-brown semi-solid mass, having a peculiar, unpleasant odour. It consists chiefly of an acid resin, with a small proportion of oily matter, insoluble in alcohol 90 per cent., but soluble in ether. Under the microscope it presents the appearance of an emulsion containing oil globules. It yields nothing to water, but is soluble to the extent of 83·5 per cent. in alcohol, 90 per cent. The alcoholic solution, after filtration, leaves on evaporation a yellowish-brown sticky transparent resin.

"The following are the chemical characteristics of the Cativo: Volatile matter and moisture, 6·5 per cent.; acid number, 126·5 per cent.; ester number, 27·2 per cent.; saponification number, 153·7 per cent.; ash, 1·54 per cent."

Cecropia, Therapeutic Action of. Gilbert and Carnot. (*Bull Comm.*, **31**, 227.) Cecropia, a plant of the N.O. Ulmaceæ, has marked cardiotonic properties. The toxicity of the fluid extract, obtained by macerating 2 parts of the fresh leaves with 1 part of alcohol (90 per cent ?), is relatively feeble, so that it may be employed without harm in large doses. It appears to exercise a cumulative action, similar to digitalis, so that the effects it produces persist for several days. It acts by increasing the energy of the contraction of the cardiac muscles so that sphygmomanometric tracings indicate doubly or trebly high pulsations. In toxic doses the pulse is lessened. It exerts a marked diuretic

action on the kidneys. It is given in doses of 30 minims in 24 hours for 4 or 5 days. After the third day of treatment a marked diuresis supervenes, while the general condition of the patient improves. In general action cecropia resembles digitalis, but is much less toxic.

Chielin. (*Merck's Report*, **1902**, 41.) Chielin is a product of tulip bulbs. It is a brownish sticky substance, dissolving freely in water, and is perfectly innocuous.

Chielin was first used with success in veterinary surgery by Regenbogen and Schaefer for the treatment of eczema, and has now been applied by H. Heymann to the treatment of similar affections in the human subject. The preparation is supplied commercially in the form of a cream and a soap. The cream is chiefly used as a cosmetic for infiltrated chronic squamous and nodular eczema, whilst chielin soap has proved useful in glandular affections, seborrhœa, comedones, and in acne vulgaris. The cream is applied twice daily with a small camel-hair brush. The soap, having been soaked in water, is applied and, after drying on the skin, allowed to remain over night.

Chillies, Japanese, the Structure of. T. E. Wallis. (*Pharm. Journ.* [4], **15**, 3.) The author thus summarizes the microscopic characters of the three species of capsicum met with in commerce:—

	C. minimum.	*C. annuum.*	*Japanese chillies.*
Epidermis.	Thick and straight-walled rectangular cells with few pits; often arranged in groups of 5 to 7 in a row and with a uniformly striated cuticle. Size of cells, 25μ to 60μ in either direction.	Irregular polygonal cells with evenly thickened walls, traversed by numerous well-marked simple pits. The cuticle shows striated ridges. Size of cells, 50μ to 100μ long, and 25μ to 50μ wide.	Cells with strongly thickened walls and a radiated lumen. The pits only rarely penetrate the whole thickness of the wall. No visible striation. Size of cells, 30μ to 80μ long, and 15μ to 45μ wide.
Hypoderma.	Delicate thin-walled cellulose cells.	Several layers of cuticularized collenchymatous cells, having a rounded outline and very few pits.	A singular layer of regular polygonal cells with cuticularized fairly thick walls, traversed by numerous pits, which give them a beaded appearance.

If some such paragraph as the following were included in the next edition of the British Pharmacopœia, it would be possible to exclude unofficial varieties of *Capsicum* used as a substitute for, or an admixture with, the official drug in the form of powder:—

When examined microscopically the pericarp shows an epidermis formed of thick and straight-walled rectangular cells which have few pits, are often arranged in groups of 5 to 7 in a row, and have an evenly-striated cuticle.

The paper is illustrated with woodcuts showing the distinctive histological elements. (See also *Year-Book*, **1902**, 170.)

Chloral Hydrate as a Vesicant. Bonnet. (*Pharm. Centr.*, **43**, 508.) Chloral hydrate forms an efficient blistering agent when applied to the skin for 20–30 minutes, and the application is not unduly painful. It is applied scattered over the surface of diachylon plaster.

Cod-liver Oil, Characters of. C. E. Sage. (*Chem. and Drugg.*, **62**, 571.) Norwegian cod-liver oil is superior in many ways to that from Newfoundland, both in method of preparation and especially in freedom from admixture. Other liver oils have been used to mix with cod-liver oil, but the Newfoundland oil consists largely of menhaden oil and seal oil. It would be difficult to say from analyses that Newfoundland oils are adulterated with the two oils already mentioned, but the following figures show the characters of each of these:—

—	Cod-liver Oil.	Menhaden Oil.	Seal Oil.
Sp. gr.	0·923–0·930	0·927–0·933	0·924–0·926
Saponification-number	179–190	192	142–152
Free acid (as oleic)	maximum, 1 per cent.	—	1·8–7·3
Iodine-number	153–170	160	142–152

Menhaden oil is prepared from the heads and intestines of fish, *Alosa menhaden* being the chief variety employed. Its colour is usually brown and its odour fishy, but it can be bleached and so fitted for admixture with a pale-coloured oil. Like most fish-oils, it has a notable acidity.

The results of the examination of samples of medicinal Norwegian oil during the past few years suggest the following requirements for a good oil: Colour, pale yellow; odour, characteristic and not fishy; taste, bland and not rancid; sp. gr.

at 15·5°C., 0·923–0·930; saponification number, 179–190; fatty acids calculated as oleic, not more than 1 per cent.; melting-point of fatty acids, 21–25°C.; cold test, no solid matter should separate during exposure to a temperature of melting ice for an hour; iodine absorption figure, 153–170.

Cod-liver Oil, Characters and Tests for, in the New Codex. E. Bourquelot. (*Journ. Pharm. Chim.* [6], **16**, 162.) The following characters and tests for cod-liver oil have been adopted for inclusion in the appoaching edition of the Codex: Pale yellow, with characteristic odour and taste, free from rancidity; sp. gr. at 15°C., 0·925–0·931. It should not thicken when cooled to 0°C., and should only slightly redden blue litmus paper, previously moistened with alcohol. 1 drop of the oil, dissolved in 20 drops of CS_2 and shaken with 1 drop of strong H_2SO_4, should afford a fine violet colour, passing to brown. If 3 drops of fuming HNO_3 be added to 15 drops of the oil and the mixture be shaken, a rose colour should at first appear, then lemon-yellow. Into a glass-stoppered 250 c.c. flask introduce an accurately-weighed quantity (of about 0·25 Gm.) of oil dissolved in $CHCl_3$ 15 c.c.; add 25 c.c. of 5 per cent. solution of iodine in alcohol, and 25 c.c. of 6 per cent. alcoholic solution of mercuric chloride; prepare also a similar mixture, but without any oil. Allow both flasks to stand, protected from the light for 4 hours; then add to each 3 Gm. of KI and 100 c.c. of water, and titrate the free iodine in each by means of N/10 sodium hyposulphite solution. The difference in the figure for iodine in the blank experiment and in that containing oil will give the iodine combined with the oil. This, when calculated for 100 parts of oil, should not be less than 144 or more than 156. Introduce into a small flask 1 Gm. of the oil and 20 c.c. of N/2 KOH solution, attach to a reflux condenser, and heat on the water bath for half-an-hour. Add a few drops of solution of phenol-phthalein, and titrate back the uncombined alkali by means of N/2 HCl solution. At least 13 c.c. should be requisite to neutralize this.

Cod-liver Oil and Sesame Oil, New Reaction for. Ciupercesco. (*Bull. Assoc. Pharm. de Rouman.*, through *Répertoire*, **15**, 219.) A reagent is prepared by mixing 9 c.c. of water and 25 c.c. of H_2SO_4, sp. gr. 1·84. 4 c.c. of cod-liver oil and 3 c.c. of HNO_3, sp. gr. 1·37, are added to 8 c.c. of this acid mixture, and well shaken for 3 seconds. A red violet colour is formed at the zone of contact on standing, and the mixture acquires a cherry-red colour on agitation. Ultimately, the oily

layer becomes yellow, the aqueous stratum colourless. No other animal oil gives a similar reaction. Sesame oil, similarly treated, gives a grass-green emulsion which remains for about a minute. Olive oil gives no colour reaction; cotton-seed oil produces a brown colour. It is claimed that the admixture of 5 per cent. of sesame with other vegetable oils may be detected by this reaction.

Colocynth Extract, Assay and Identification of. W. Braeutigam. (*Journ. Pharm. Chim.* [6], **16**, 130, after *Pharm. Zeit.*) 1 Gm. of finely powdered extract of colocynth is extracted with 2 successive quantities, each of 30 c.c. of alcohol 90 per cent., for 1 hour at 20–25°C., with frequent agitation. The residue is again washed with 20 c.c. of alcohol. The bulked alcoholic solution is filtered and evaporated to dryness. The residue is triturated with water, made up to about 120 c.c. and left in contact for 20 hours at 25°C., with frequent and thorough agitation. The mixture is then filtered, the filter washed with 20 c.c. of water, and then 0·25 Gm. of lead acetate is dissolved therein, and 3 Gm. of solution of basic lead acetate added. When precipitation is complete, the precipitate is filtered out and washed with two lots, each of 30 c.c. of water. To the filtrate, aluminium sulphate 2 Gm. and animal charcoal 4 Gm. are added, and the mixture is evaporated to dryness. The residue is shaken up with two successive 30 c.c.'s of ether, and the ethereal extract evaporated. The residue is macerated twice in succession, each time for 1 hour, with alcohol 40 Gm., and finally washed with another 30 Gm. The bulked alcoholic solutions are filtered and evaporated to dryness. The residue is taken up with a little absolute alcohol, and filtered through a small filter, previously moistened with alcohol, the filtration being repeated until the liquid is quite bright. The filter is washed with a little absolute alcohol; the bulked liquids are evaporated in a small tared capsule. The residue is dried to constant weight, and weighed as colocynthin. It should not be less than 0·04 Gm., and should be completely soluble in 2 c.c. of absolute alcohol. On adding 2 drops of this solution to 4 c.c. of ether, a flocculent white precipitate should be obtained; and the same quantity should give with 4 c.c. of water a cloudy solution which precipitates on standing. 1 or 2 drops of the colocynthin solution, evaporated to dryness at a gentle heat, should give a fine red colour when treated with H_2SO_4. A similar residue should give a cherry-red colour with Froehde's reagent; and with sulphuric

acid containing 0·5 per cent. of ammonium vanadate, a red colour, gradually becoming blue at the edges of the liquid.

Condurango Extract, Identification of. R. Fibras. (*Giorn. di Farm. de Trieste*, through *Répertoire* [3], **15**, 223.) The aqueous solution of the extract is treated with NaCl to saturation. The precipitate formed is collected, washed with saturated NaCl solution, then washed through with $CHCl_3$; this chloroformic solution, when shaken up with equal volumes of H_2SO_4, HCl and alcohol, and gently warmed, becomes green; the addition of a trace of Fe_2Cl_6 converts this colour into a deep blue.

Creosote Camphorate. (*Pharm. Centr.*, **44**, 7.) This is a molecular combination of camphor and creosote; it forms a thick, oily liquid, insoluble in water. It is prescribed as a nervous sedative in doses of 3 grains, 3–5 times a day, in capsules or in oily solution.

Cryogenin. Dumarest. (*Lyon Med.*, through *Répertoire* [3], **14**, 543.) Cryogenin, the commercial name for meta-benzamido semicarbazide, is a new antithermic which acts solely by diminishing the temperature, and has no sedative or analgesic effect at all. It is a white, crystalline powder, sparingly soluble in water. It is given in fevers in doses of 9–18 grains per diem, when it brings about a rapid fall in the temperature; the same result may be obtained by the repeated administration of much smaller doses, of 6 or even 3 grains, continued for several days. No ill effects whatever have been observed after prolonged use of the antithermic, which is considered to be preferable to all others. It is recommended that the larger dose should be given first, and the effect maintained, if desired, by the subsequent use of smaller doses.

Cryogenin, Distinctive Reaction for. Manseau. (*Répert. de Pharm.* [3], **15**, 212.) If a particle of cryogenin be heated in a test tube with 1 or 2 c.c. of H_2O_2, a marigold-yellow colour is developed, which passes to orange, or even red, if much cryogenin be present. Although that compound is but sparingly soluble in water, the reaction is sufficiently delicate to detect its presence in aqueous solution.

Delphinium scopulorum, New Alkaloid in. (*Merck's Report*, **1902**, 48.) G. Heyl has isolated a new base from *Delphinium scopulorum*, delpho-curarine, which differs from the alkaloids found in *D. staphisagria*. In physiological reaction it closely resembles curarine.

Derris uliginosa, Anatomy of the Stem of. P. E. F. Perredès. (*Proc. Amer. Pharm. Assoc.*, **50**, 321.) An account of a very complete histological investigation of the microscopic structure

of the fish poison (see *ante*, p. 71) is given in detail, accompanied by excellent drawings. Being unsuitable for abstraction, reference should be made to the original.

Digitalis Leaves, Fallacy of Valuing on Digitoxin Content. H. Ziegenbein. (*Archiv der Pharm.*, **240**, 454.) After a very thorough investigation with all the recognized methods, and with material derived from all available sources, the author concludes that any valuation of digitalis leaves, based on the amount of digitoxin present, is quite misleading. The physiological test alone is reliable. Comparative results show that there exists no relation whatever between the digitoxin content and the physiological activity of the drug; thus leaves containing only 0·125 per cent. of the glucoside are twice as toxic as those containing 0·226 per cent. Further, it is shown that a solution of pure digitoxin, in the same proportion as that found in certain leaves, is roughly from 2–6 times less active than an equivalent quantity of the soluble extract of the same leaves. The prevailing opinion that digitalis leaves decrease in activity by age is fully borne out by physiological tests. These were performed quantitatively on frogs, and the digitoxin was determined by the Keller-Fromme method.

Dionine. (*Mercks' Report*, **1902**, 53.) The use of dionine as an analgesic and sedative appears to be extending, its value depending mainly on the absence of secondary reactions, and the fact that its repeated use does not result in the acquirement of a habit, such as follows the use of morphine and its other derivatives. In asthma Bruegelmann prescribes it with morphine thus: Dionine, 10; morphine hydrochloride, 1; distilled water, 100, to make an injection, of which 0·5 c.c. is given hypodermically. Rodet finds dionine to be useful in treating the morphine habit; J. Weigl prescribes it for whooping cough in children. L. Neufeld reports favourably of its action in nervous headaches, and O. Frankl finds the administration of half a grain serviceable in relieving pain in dysmennorrhœa. Inflammatory affections of the female generative organs are relieved by the use of the following pessaries: Dionine, ½ grain; ammonium ichthyol, 3 grains; cacao butter, 30 grains. It has also found wide application in ophthalmic practice as an analgesic, for promoting the nutrition of the tissues, and for stimulating mydriasis. It is employed for the purpose in the form of 2–6 per cent. aqueous solutions. Its use is contra-indicated in the case of aged patients with arterial sclerosis.

Diosmal. P. Runge. (*Pharm. Centr.*, **43**, 466.) An active

preparation of buchu is prepared under this name, and recommended in doses of 2–6 grains, in gelatin capsules, in affections of the urino-genital organs. It is thus prepared: Buchu leaves are first extracted with light petroleum ether, the solvent distilled off and the residue reserved. The marc from the petroleum ether extract is again exhausted with boiling 80–90 per cent. alcohol. This menstruum is also distilled off, and the residual extract mixed with that obtained with petroleum ether.

Drugs and Narcotic Extracts, Valuation of. H. Thoms. (*Pharm. Journ.* [4], **16**, 847.) In a communication to the International Congress of Applied Chemistry, in Berlin, the author directed attention to the prevailing custom of valuing drugs by determining one constituent only, and raised the well-known contention that the therapeutic activity of the drug is not necessarily identical with that of the constituent which is taken as the basis of valuation. Quinine could not take the place of decoction of cinchona, nor morphine the place of opium, nor strychnine that of nux vomica, and in support of this he pointed out that galenical preparations of crude drugs maintain their position even after the introduction of the so-called active constituents. His deduction from this was to the effect that constituents of the drugs other than alkaloids or similar "active principles" are by no means inactive, but play an important part in the action of the drug, either by reason of their special therapeutic properties or by favourably influencing the absorption of other bodies. Hence, in valuing a drug, the pharmacist should devote more attention to the consideration of these other constituents and to their determination. Working in this direction, he has devised a process for the determination of tannin and total organic acids in extract of belladonna. The following is the process for the determination of the tannin:—

5 Gm. of extract is dissolved in 20 c.c. of water, filtered, and the residue washed with 10 c.c. The tannin is then separated by the addition of 20 Gm. of ammonium sulphate, collected, washed with a saturated solution of ammonium sulphate, and extracted with boiling 90 per cent. alcohol, by which the tannin is dissolved. The solution is evaporated, the residue dried at 100°C. and weighed. It is now extracted with warm water and the solution made up to 1 litre, of which 10 c.c. is mixed with 20 c.c. of 20 per cent. sulphuric acid and titrated with N/10 potassium permanganate. This is effected by boiling for 5 minutes with 10 c.c. of the permanganate, decolorizing by 10 c.c. N/10 oxalic acid, and adding N/10 permanganate until the colour is restored.

The total organic acid is determined in the filtrate after the precipitation of the tannin by ammonium sulphate by acidifying with 20 c.c. of 20 per cent. sulphuric acid, and shaking out 4 times in succession with 15 c.c. of pure ether, free from acid. The ethereal solution is then titrated with N/10 caustic potash.

The name proposed is "permanganate number" for the number of milligrammes of potassium permanganate necessary to oxidize the tannin, obtained as indicated, from 1 Gm. of extract. This number will vary with the proportion of tannin the extract contains, but cannot naturally be regarded as an exact measure of the tannin present, owing to the difficulty of separating this substance from the other constituents of the extract. The organic acids determined are partly volatile, partly fixed; chief amongst the latter are probably malic and succinic acids.

The following method is recommended for the determination of total alkaloids in belladonna extract:—

2 Gm. of extract is dissolved in 50 Gm. of water, acidified with 10 per cent. sulphuric acid, 10 c.c., and precipitated with potassio-bismuthic iodide, 5 c.c. The precipitate is washed twice with sulphuric acid, 5 c.c., transferred to a stoppered cylinder, decomposed with 15 per cent. caustic soda, 30 c.c., and sodium sulphite, 0·3 Gm.; sodium chloride, 15 Gm., is quickly added, and ether, 100 c.c. After well shaking and standing, 50 c.c. of the ethereal layer is titrated with iodeosin as indicator. By this means hyoscyamine, atropine, scopolamine and the volatile alkaloids are determined together. If the determination of the latter is not desired, then the ethereal solution can be evaporated, dried until the narcotic odour disappears, and weighed.

The following table gives the results of the examination of 5 samples of extract of belladonna:—

Sample.	Weight of Tannin Yielded by 1 Gm.		KOH to Neutralize Acid in 1 Gm.		Permanganate Number.		Moisture Per Cent.	Alkaloid by Ph. G. Method. Per Cent	Alkaloid by Thoms' Method. Per Cent
	I.	II.	I.	II.	I.	II.			
A	0·107	0·122	0·020	0·019	204·6	200	14·15	2·15	1·4
B	0·034	0·036	0·018	0·016	81	82	15·77	1·72	1·19
C	0·088	0·076	0·020	0·024	206·3	227	10·85	1·57	1·05
D	0·081	—	0·018	—	256	—	11·46	1·72	1·15
E	0·059	0·053	0·016	0·018	98	86	15·10	1·73	1·48

Echinacea angustifolia as a Remedy for Hæmorrhoids. (*Merck's Report*, **1902**, 61.) 2 drachms of a mixture of equal parts of the fluid extracts of *Hamamelis virginica* and of the root of *Echinacea angustifolia*, injected into the rectum after an evacuation, is found to be a most effectual remedy for piles. As a rule, 3 injections are sufficient to effect a cure.

Ektogan. Frenkel. (*Progrès Medicale*, through *Répertoire* [3], **15**, 70.) Ektogan is the pseudonym for zinc peroxide, ZnO_2. It is a faintly yellow, light powder, without taste or odour. It evolves 9·08 per cent. of oxygen on contact with acids equivalent to 55 per cent. of ZnO_2. It is recommended for external use as a substitute for H_2O_2. By mixing ektogan 3 with tartaric acid 4, in the form of a paste, an equivalent of 1 part of H_2O_2 is obtained. The author states that the nascent H_2O_2 thus produced *in situ* is markedly more active as a bactericidal and healing agent than the same quantity of that body applied, in the usual way, in aqueous solution.

Emodin as an Aperient. W. Ebstein. (*Merck's Report*, **1902**, 57.) In doses of 1½ grains emodin acts as an efficient and pleasant aperient. It should be prescribed in the form of pills composed of emodin, 15 grains; powdered licorice root, 15 grains; extract of licorice, sufficient to mass. Divide into 20 pills, 1 or 2 to be taken in the evening.

Epiosine. (*Merck's Report*, **1902**, 57.) Epiosine, $C_{16}H_{12}N_2$, occurring in prismatic crystals, melting at 195°C., is a morphine derivative, identical with methyl-diphenyl-amidazol. It is the amidazol derivative of morphinogenine chloride. It possesses marked sedative and hypnotic effects similar to those of dionine, the minimum effective dose being, for adults, 1½ grains to 2 grains. The unpleasant taste of epiosine is best disguised by admixture with milk.

Epithol. (*Merck's Report*, **1902**, 58.) "Epithol Gold" and "Epithol Silver" are two alloys of tin and copper, in the form of an extremely fine bronze powder, which have been applied by L. Hoffmann as antiseptics for wounds in veterinary practice. The powder is pressed over the wound by means of a spatula. The dressing is specially serviceable in the treatment of saddle galls. It is also useful in eczema and other skin diseases of animals. The epithols are quite innocuous, and give rise to no irritation, while they are effective antiseptics.

Equisetum arvense as a Hæmostatic. N. S. Jdan-Pouch-

kine. (*Semaine Med.*, through *Bull. Comm.*, **31**, 83.) An infusion of the dried powdered plant, obtained by infusing a tablespoonful of the powdered herb in a cupful of boiling water and decanting after 15 minutes, is found to be a valuable internal remedy for various hæmorrhages, such as epistaxis, hæmoptysis, menorrhagia, metrorrhagia and bleeding hæmorrhoids. The dose is a cupful, repeated, if necessary, twice or thrice daily. No secondary ill effects result from the drug, which does not appear to derange the digestive organs.

Ergotin, Determination of. Keller (*Apoth. Zeit.*, **22**, 183, through *Chem. and Drugg.*, **61**, 88) gives the following process for the determination of ergotin in ergot of rye: 25 Gm. of the powdered ergot is freed from fat by extraction with petroleum ether, and then treated with 100 c.c. of ether; 20 c.c. of water is added after an hour, and 1 Gm. of magnesia, and then well shaken for an hour. After standing, 80 c.c. of the ether is separated, corresponding to 20 Gm. of ergot, and this is extracted with dilute hydrochloric acid. The acid extraction is repeated several times, the mixed acid liquids are then rendered alkaline, and extracted with ether. The ether extraction is repeated 3 times, and the mixed ethereal liquids are evaporated in a tared basin, and the residue, consisting of fairly pure ergotin, is weighed.

Eucalyptus Leaves in Glycosuria. A. G. Faulds. (*Glasgow Med. Journ.*, through *Pharm. Journ.* [4], **15**, 113.) An infusion of eucalyptus leaves is stated to exert a decided effect in lessening the excretion of sugar, and, in some cases, apparently, to effect a cure in diabetes. Having heard of the cure of a case of diabetes in Australia following the use of an infusion of fresh eucalyptus leaves taken in the first instance as a remedy for influenza, the author was induced to experiment with a similar preparation from dried leaves in this country. Of 46 cases treated 15 showed a total disappearance of the disease. Oil of eucalyptus was not found to possess any action whatever.

Eukinase and Pancreatokinase, Intestinal Digestive Ferments. Hallian and Carrion. (*Nouv. Rèm.*, **19**, 25.) Eukinase is a peculiar ferment extracted from the duodenal mucous membrane of the pig, which contains, in a very active state, the enterokinase of Pawlow. It has the remarkable property of enabling the pancreatic juice to digest albumin with extraordinary rapidity. Pancreatokinase is a combination of eukinase and pancreatin.

Eukinase alone is considered to be a eupeptic; it does not itself digest albumins; pancreatokinase, on the contrary, is a powerful digestive, and is a valuable remedy in intestinal dyspepsia. These ferments are administered in two forms, to enable them to traverse the stomach without undergoing destruction. They are either enclosed in a gluten capsule, or are massed to a paste with gluten, which, when dry, is reduced to a granular powder. The latter form is specially useful for administration to infants.

Filmaron, the Active Constituent of Male Fern Extract. F. Kraft. (*Pharm. Zeit.*, **48**, 275.) In addition to flavaspidic acid, albaspidin and aspidinol, Kraft has isolated two other constituents from male fern root, flavaspinidin and an amorphous acid which he has named filmaron. This is proved to be the active anthelmintic principle of male fern root.

Filmaron, $C_{47}H_{54}O_{16}$, is a bright, yellowish-brown powder, insoluble in water, difficultly soluble in cold methyl or ethyl alcohol and petroleum spirit, but very soluble in most other solvents. Its slight solubility in petroleum spirit distinguishes it from aspidinol and the filix-nigrins. The separation of crystals from its solution in carbon disulphide indicates the presence of flavaspidic acid, from its ethereal solution aspidin, and from its acetic ether solution filicic acid. The rhizome contains about 5 per cent. of filmaron.

When dissolved in acetone it slowly decomposes into filicic acid and filix-nigrin; boiling alkalies in conjunction with nascent hydrogen split it up into filicic acid and aspidinol or their decomposition products; with diazoamidobenzol it yields the azo-compounds characteristic of filicic acid and flavaspidic acid. It probably contains four butanones, one of which is identical with aspidinol, whilst the other three are identical with filicic acid; two of these three are identical with albaspidin or flavaspidic acid.

Jaquet has examined all these constituents pharmacologically. Aspidinol was destitute of any particular action. Neither filicic acid, crystalline or amorphous, nor flavaspidic acid, nor combinations of these two bodies in doses up to 0·5 or 0·8 Gm., had any appreciable anthelmintic action. Albaspidin in doses of 0.5 Gm. exhibited a slight action, but filmaron in doses of 0·5 to 0·7 Gm. was successful in 30 cases, without exception, including children of 7 years.

Formane. Wedekind. (*Annales de Pharm.*, **8**, 483.) Chlormethyl menthyl ether, $C_{10}H_{19}O.CH_2Cl$, has been introduced as a remedy for coryza, in the form of an inhalation. It is prepared

by combining menthol and formaldehyde in the presence of gaseous HCl, according to the equation $C_{10}H_{19}OH + HCl + CH_2O = C_{10}H_{19}O.CH_2Cl + H_2O$. In the presence of water the compound is split up into its component parts; the formaldehyde and menthol are volatilized in the steam of the inhalation, while the HCl remains in solution in the water. In practice, a double tube inhaler is used, each tube being introduced into the nostrils. The formane is dropped into very hot water in the inhaler, and the vapour inspired through the nostrils, expiration being performed by the mouth. In young children an ointment of formane may be applied directly up the nostrils.

Gallogen. (*Pharm. Zeit.*, **47**, 580.) Gallogen is another name for ellagic acid, obtained from divi-divi. It is closely allied to gallic acid and the tannins. It is a yellowish, tasteless powder, insoluble in acid or neutral solutions, but dissolved to a certain extent by alkalies, a 1 : 50 warm solution throwing out on cooling. In astringent properties it resembles tannin, while its freedom from taste renders its administration easy. Its insolubility in acid media enables it to pass through the stomach without disturbing the digestive powers, and it is not until it comes in contact with the alkaline intestinal secretions that its astringency comes into play. Being a pure astringent principle, it has greater efficacy than such bodies as tannigen, tannalbin and tannocoll, since these only contain 50–80 per cent. of their weight of tannin. The dose is 45–80 grains per diem for adults, and $4\frac{1}{2}$–8 grains for children.

Gentian Root, Dried, and Powdered Gentian. E. Bourquelot and H. Hérissey. (*Journ. Pharm. Chim.* [6], **16**, 513. See also *Year-Book*, **1902**, 66.) A mere glance at the fractures of fresh and dried gentian root, especially in the form the latter is generally met with in pharmacy, is sufficient to demonstrate that the drug has undergone a profound change. The fresh root is white, whereas the dried drug has a reddish-brown fracture. It is possible, by careful drying and storing, to obtain a light-coloured dried root, but such is seldom seen in pharmacy, and buyers seem to prefer the darker coloured roots. This change is evidently due to fermentation, and the methods by which the roots are treated when gathered are expressly directed to favouring the process. Before the roots are dry, 8 or 10 days after gathering, they are placed in heaps. As the mass heats, it is turned over from time to time so as to bring the inner roots to the surface. Drying is

only completed when the roots have acquired the desired reddish tint.

These red roots yield much less extractive than those which have been carefully dried without previous fermentation. The powdered root contains but little of saccharose, gentianose, and gentiopicrin, which was originally present in the fresh state; and the extract prepared from it by the official method of the Codex (extraction with *cold* water) contains none. The powdered root contains, besides the glucose and levulose originally present in the fresh root, the sugars which are formed by the action of the soluble ferments on the saccharides and the glucoside in the root. It also contains a little free gentiobiose. The aqueous extract contains only hexoses and gentiobiose; the latter contributes slightly to the bitter taste of the preparation. Gentiobiose is more readily isolated from the powdered root, or its aqueous extract, although the yield is small, than from gentianose, since the separation of that sugar in a pure state is not easy.

Glycosal, Further Notes on. (*Merck's Report*, **1902**, 72.) Further investigation of the properties of glycosal show that, in addition to its general efficacy in rheumatic affections, it is also particularly efficacious in cystitis. It has the advantage over salicylic acid and salol that it does not produce tinnitus nor derange the digestion. It is given in doses of 45–90 grains per diem. As an external remedy it has proved useful in counteracting keratinization in certain skin diseases, such as chronic squamous eczema. For such cases it may be prescribed in the form of an ointment, thus compounded: Glycosal, 45–75 grains, dissolved in sufficient alcohol, is incorporated with vaseline, 1 oz., lanoline, 1 oz.

Guaiacol in the Treatment of Small Pox. J. J. Ridge. (*Brit. Med. Journ.*, **1903** [1], 1257.) An oily solution of guaiacol 1, in olive oil 80, has been found of extreme value in the local treatment of small pox eruption. It was applied with a cotton swap over the entire surface of the eruption every 4 hours. Irritation was thereby allayed, maturation of the pustules cut short, the temperature lowered, and the characteristic odour of the eruption removed, so that the wards containing many cases were quite sweet. The numbers of deaths under this treatment were remarkably small, and the recoveries good, although the cases treated included many severe types of the disease.

Guaiasanol. A. Einhorn and H. Hentz. (*Archiv der Pharm.*, **240**, 631.) In the course of an investigation of gycocol-phenol compounds, the synthesis of diethyl glycocol-guaiacol has been effected; the hydrochloride of the base, $C_6H_4.OCH_3.O.CO.CH_2.N(C_2H_5)_2.HCl$, has been suggested as being likely to be serviceable in medicine, in consequence of the facility with which it is decomposed in the presence of a trace of alkali, liberating guaiacol. This salt has been named guaiasanol. It is obtained by the action of chloracetyl-guaiacol with diethylamine, which results in the formation of the oily base, diethyl glycocol-guaiacol; this is saturated, in alcoholic solution, with alcoholic HCl. Guaiasanol then crystallizes in prismatic needles, which melt at 184–186°C. It is claimed to be superior in therapeutic action to any of the guaiacol compounds yet obtained.

Gums from German East Africa. C. Mannich. (*Journ. Pharm. Chim.* [6], **16**, 214, after *Tropenpflanzer*, **1902**, 201.) The author has examined the gums brought back by the Busse expedition, determining the bassorin, ash, and rotation of a 10 per cent. solution in a 100 mm. tube.

Acacia verek gum occurs in fragments of various size and colour; the amount of ash increases with the depth of colour; thus colourless tears have 2·622 per cent., and the brown grains 3·22 per cent. It is feebly lævogyre −1·1°. It contains no bassorin.

Acacia kirkii, in grains and small fragments, generally colourless, contains no bassorin. Ash, 2·56 per cent; rotation, +2·6°. The solution gives a fairly adhesive mucilage with a faintly acid reaction.

Acacia seyal, in pieces of variable size and colour; contains but little bassorin. Its solution is not precipitated by basic lead acetate. Ash, 1·7 per cent; rotation, +5·1°.

Acacia spirocarpa. The transparence and percentage of ash varies in different samples with the age of the trees yielding them. Thus a fine translucent pale coloured gum, derived from adult plants, has the rotation −2·6°, while the small opaque tears gathered from young trees are dextro-rotatory +1·4°. The ash of the former is 1·8 per cent., of the latter 3·02 per cent.

Acacia arabica, in pale coloured pieces, the size of a nut, traversed by minute cracks. It contains a trace of bassorin. Its rotation is +7·98, the ash 1·55 per cent. It gives no precipitate with basic lead acetate, nor with Fe_2Cl_6, which only slightly increases the consistence of the liquid.

Acacia stenocarpa. The product of this species appears to be confused with the gum known commercially as Sennaar or Suakim gum. It contains bassorin, and 3·7 per cent. of ash ; the rotation is $+4·75°$.

Acacia usambarensis, in brown masses, formed of agglomerated tears with a vitreous fracture. It swells to a fairly thick mucilage with 10 times its weight of water; it contains much bassorin, together with arabin. Ash, 1·93 per cent.

Berlinia emini yields a gum closely resembling tragacanth ; it occurs in horny, opaque, brown pieces with a faint peculiar odour. It gives a gelatinous mass with 10 times its weight of water, and with 50 parts a slightly acid mucilage which precipitates with neutral lead acetate. Its ash is 5·78 per cent. It contains no starch.

A gum of unknown botanical origin is distinguished by the slightly green reflection shown by large masses. The pieces are much fissured. It gives a good mucilage of strong adhesive power. The ash is 3·692 per cent., the rotation $-0·78°$.

Helmitol (*Journ. Pharm. Chim.* [7], **17**, 27.) This is stated to be a combination of hexamethylenetetramine with an anhydromethylene citric acid. In the organism, in the presence of alkali, it is decomposed into formaldehyde and hexamethylenetetramine. It occurs in fine crystals, soluble in water 1:14, and insoluble in alcohol. It decomposes at about 163°C. It is given in infectious maladies of the urino-genital system, in doses of 45–60 grains per diem, as a general fermenticide and antiseptic. It has given good results in cystitis.

Honey, Dextro-rotatory of Smyrna. Ali Riza. (*Journ. Pharm. Chim.* [6], **16**, 386.) Although the majority of natural honeys, when pure, are lævogyre, it is well known that some kinds obtained in forest-covered districts, such as the Black Forest, are dextro-rotatory. The author has examined specimens of pure honey in the comb from the neighbourhood of Smyrna, and has found them all to be dextro-rotatory ; solutions 2 : 1, having the rotation from $+6·2$ to $+4$. These pure Asia Minor honeys had, in some cases, been rejected as being adulterated with glucose.

Hopogan. Frenkel. (*Progrès Méd.*, through *Répertoire* [3], **15**, 70.) This name is applied to a mixture of magnesia and magnesium peroxide. It is a white, light, odourless and tasteless powder, almost insoluble in water. It evolves, when treated with acid, 7·15 per cent. of active oxygen equivalent to 25 per cent. of MgO_2. It may be given in doses of 7½ grains. Since it liberates

iodine from iodides, care must be taken not to prescribe it simultaneously with those salts.

Hydrastis canadensis for Enlargement of the Thyroid. (*Merck's Report*, **1902,** 62.) In addition to its action on the female generative organs, *Hydrastis canadensis* is found by W. Cuthbertson to exert a powerful influence on the thyroid gland, lessening enlargements of simple vasicular hypertrophy, such as occur during pregnancy or puberty. In such cases the fluid extract is administered thrice daily in cases of 20 minims, immediately after meals, and the treatment is continued for from 6 weeks to 3 months.

Hydrastis canadensis in Renal Hæmorrhage. W. Bramwell (*Med. Press*, **124,** 511) finds that the fluid extract of hydrastis is a valuable remedy in checking renal hæmorrhage. In a case of hæmaturia from congested kidney, 10 minim doses arrested the hæmorrhage, which did not recur. Although the value of the drug is appreciated in the treatment of uterine hæmorrhage, its usefulness in renal cases does not appear to be known.

Iodipalme. (*Répertoire* [3], **15,** 164.) This is a compound of iodine with a fixed oil containing either 10, 20 or 30 per cent. of iodine. The weaker preparation is the colour of ordinary oil; that containing 20 per cent. of iodine is a little darker; 30 per cent. iodipalme is a deep brown liquid. It is quite free from toxicity; 20–30 c.c. may be injected daily without giving rise to any inconvenience. When given by the mouth it should be enclosed in gluten capsules, or mixed with cod-liver oil, or suspended in an emulsion; thus exhibited, the dose is $1\frac{1}{2}$–5 grains per diem. It may also be given in the form of rectal injections, or hypodermically in the gluteal region. For young children 1 c.c. of 10 per cent. iodipalme may be thus injected; 2 c.c. for older children, and 5–10 c.c. for adults. It is indicated in asthma, arterio-sclerosis, syphilis and scrofula.

Iodocresin (Traumatol) as an Internal Remedy for Tuberculosis. Kaminsky. (*Merck's Report*, **1902,** 101.) As traumatol, iodocresin has for some years been used as an external antiseptic. Kaminsky now reports that it yields good results when administered internally in the primary stages of tuberculosis. The treatment has to be prolonged for a considerable time; to avoid the acquirement of toleration, the initial dose of $\frac{1}{6}$ grain 3 times daily is gradually increased up to a daily dose of $1\frac{1}{2}$ grains, when it is again gradually diminished. It is claimed that

bacilli disappear from the sputum, under this treatment, in 2 or 3 months. The digestive organs are not in any way disturbed.

Iodophene (New). (*Merck's Report*, **1902**, 102.) The looseness with which names are applied to new preparations is well instanced by iodophene. Some 10 years ago this title was given to phenolphthalein tetraiodide, which subsequently became known as nosophene. Now the name iodophene is given to a totally different body, a combination of bismuth and aluminium with di-iodophenol. It forms an orange-red powder, and is used as an astringent antiseptic dressing for wounds, and as a general substitute for iodoform.

Iodyloform. (*Bull. Comm.*, **31**, 230.) This is a compound of iodine with an inert gelatinous substance, containing 10 per cent. of iodine. It occurs as brownish-yellow, odourless, insoluble powder, which has been found by Sperling to equal iodoform in disinfectant power. Mueller has found it serviceable as a dressing for venereal sores, and for boils and abscesses. Its action is less rapid than that of iodoform, and the first application causes a slight smarting, but this is more than compensated for by the absence of odour. Phenol or sublimate must not be employed simultaneously with iodyloform, since they then occasion a caustic and irritant action.

Ipecacuanha Alkaloids, Physiological Action of. C. Lewin. (*Arch. Internat. Pharm.*, through *Pediat.*, **15**, 120.) The author's results in the investigation of the physiological action of emetine and cephaeline are practically identical with those of R. B. Wild (*Pharm. Journ.* [4], **1**, 405, 435). Lewin also finds that emetine is the better expectorant, while cephaeline is the more powerful emetic. Emetine is found to act more powerfully on the heart than cephaeline, although both bases are heart poisons. Both cause irritation of the mucuous membrane, but neither affect the subcutaneous connective tissue when brought into contact with it. Characteristic intestinal symptoms are caused by both, but cephaeline acts more on the kidneys. Poisoning with emetine leaves the lungs free from pathological changes ; with cephaeline there may be slight extravasation of blood.

Ipecacuanha, the Ash of. A. G. Paterson. (*Pharm. Journ.* [4], **16**, 387.) The amount of ash met with in different samples of ipecacuanha root is shown in the following tables ;—

BRAZILIAN IPECACUANHAS.

Number and Nature of Sample.	Percentage of Moisture.	Ash.	Insol. in HCl.	Sol. in HCl.
1. Picked Roots, Rio	11·34	1·86	0·21	1·65
2. „ „ „	11·79	3·22	0·51	2·71
3. „ „ „	11·29	3·00	0·37	2·63
4. Brazil, Ipecac. (Wiry & Stemmy)	10·68	3·02	0·44	2·58
5. „ „ (Lean & Stemmy)	12·11	2·81	0·36	2·45
6. „ „ (Inferior, Dusty and Stemmy) .	11·22	3·8	1·15	2·65
7. „ „ (Stem, same bale as No. 2) . . .	10·72	3·6	0·41	3·19
8. „ „ (Mouldy Root) .	12·43	3·00	0·18	2·82
9. „ „ (Stem)	10·62	2·82	0·42	2·4
10. Indian Ipecac. (Cultivated) .	—	2·54	0·163	2·38
Average	11·35	2·96	0·421	2·54

CARTHAGENA IPECACUANHAS.

Number and Nature of Sample.	Percentage of Moisture.	Ash.	Insol. in HCl.	Sol. in HCl.
11. Picked Fine Root	11·77	2·45	0·51	1·94
12. Inferior Root	11·19	3·9	1·09	2·81
13. Inferior Root	11·00	4·76	1·45	3·31
14. Poor Small Dusty Root . .	11·12	5·95	1·59	4·36
15. Very Dusty and Mouldy Root	11·71	5·1	1·68	3·42
16. Poor Dusty Root	11·44	3·66	1·04	2·62
17. Stem from Fine Sample . .	12·15	4·78	1·48	3·3
Average	11·48	4·37	1·26	3·11

IPECACUANHA SUBSTITUTES.

Number and Nature of Sample.	Percentage of Moisture.	Ash.	Insol. in HCl.	Sol. in HCl.
18. *Cryptocoryne spiralis* . . .	—	4·24	0·646	3·594
19. *Psychotria emetica* . . .	—	4·75	0·917	3·833
20. *Ionidium ipecacuanha* . . .	—	4·5	0·289	4·211
21. *Richardsonia scabra* . . .	—	5·71	0·6	5·11
Average	—	4·8	0·618	4·187

COMMERCIAL POWDERED IPECACUANHAS.

Number and Nature of Sample.	Percentage of Moisture.	Ash.	Insol in HCl.	Sol. in HCl
22. Brazilian Powder.	12·12	2·9	0·5	2·4
23. " "	10·62	3·3	0·75	2·55
24. " "	11·03	2·87	0·445	2·425
25. Carthagena	10·3	8·95	4·18	4·77
Average	11·01	4·50	1·47	3·03

Jalap, Determination of Resin in. A. B. Lyons. (*Pharm. Review*, **21**, 61.) 5 Gm. of finely powdered jalap is extracted by percolation with ether; the ethereal extract is evaporated in a tared dish, dried and weighed as "ether soluble resin." The marc, when dry, is extracted with a menstruum of 3 volumes of alcohol and 2 volumes of $CHCl_3$. The extract is transferred to a separator, shaken out with 20 c.c. of water and separated, the lower layer drawn off into a tared capsule, and the solvent evaporated. Meanwhile the aqueous residue in the separator is again treated out with a mixture of $CHCl_3$, 3 c.c., and alcohol 2 c.c., the solvent being rotated with, but not shaken up in, the aqueous liquid. The chloroformic layer is added to that at first obtained. The residue of these is dried and weighed as "resin insoluble in ether."

Kino from Eucalyptus drepanophylla. C. Mannich. (*Journ. Pharm. Chim.* [6], **16**, 216, after *Apoth. Zeit.*) The kino derived from *Eucalyptus drepanophylla* occurs in larger pieces, of a brighter colour than *Pterocarpus* kino, which, however, it is capable of replacing. It is fairly soluble in water, more so in alkaline liquids; its aqueous solutions are coloured violet by salts of iron; it contains much gum, which interferes with its solubility in alcohol. The ash amounts to but 0·09 per cent.

"Komanga" Bark from Erythrophlæum couminga. E. Heckel. (*Répertoire* [3], **14**.) The botanical source of the poison of the Sakalaves known as "komanga" or "kimanga," is traced to *Erythrophlœum couminga.* All parts of the tree are extremely toxic, so much so that the natives of Madagascar state that the odour of the flowers and the smoke of the burning leaves or wood are poisonous. The bark is the part employed by the natives either as medicine or as a poison. A very small quantity suffices to kill

a medium-sized dog in a few minutes. The principle symptoms of poisoning are glairy vomiting and purging, with mucous blood-stained stools. It appears to be but little used as a drug by the natives, except as an external remedy; a decoction of the bark being employed as an application for ulcerous sores. It is generally held in superstitious dread on account of its intensely poisonous properties.

A full botanical description is given, illustrated by drawings. It is suggested that the bark may find useful application, like that of its congener, *E. guineense*, as a remedy in heart disease. But little is known of the chemical constituents of the drug, except that Gallois and Hardy (*Year-Book*, **1877**, 171) state that it contains an alkaloid closely resembling, if not identical with, erythrophleine, isolated by them from *E. guineense*. If this base be absolutely identical with erythrophleine, or in what proportion it exists in the bark, is as yet unknown.

Lachnanthes tinctoria, Constituents of. J. A. Gardner. (*Lancet*, **1902**, 72.) A preliminary chemical examination of *Lacnanthes tinctoria*, for which valuable remedial properties in phthisis have been claimed, show that it contains resinoid constituents, as well as crystalline bodies which may ultimately prove to be of an alkaloidal nature. Further results are awaiting more material.

Lactic Acid in Dysentery. J. D. Hunter. (*Sémaine Méd.*, through *Merck's Report*, **1902**, 10.) Lactic acid, in the dose of 15 drops, suitably diluted every 2 hours, has been found useful in tropical dysentery. Commencing with the above dose, the amount is gradually diminished until a dose of 2 minims is reached.

Lævulose as a Nutritive in Disease. (*Therapist*, **12**, 146.) Fruit sugar is stated by several authorities to be a useful food in such cases where the ordinary processes of nutrition are defective, as well as affording a harmless sweetening agent for the diet of diabetics. Hale White has shown that in the latter cases, when given in moderate doses, it does not increase the amount of sugar excreted in the urine, and that some of it is retained and used up in the body. In this he has been confirmed by G. L. Peabody. Clemm and Weber have found it to be a valuable addition to the diet of tuberculous patients, Weber finding that it is oxidized much more completely in the body than any other sugar. He claims to have cured a series of cases of initial

phthisis by treatment with a lævulose diet alone. In advanced cases, the administration was supplemented by paraffin injections, with the best results. Clemm has used lævulose in the diet of scrofulous and rachitic children, in which cases he has found it to be equally serviceable.

Mace, Bombay, Detection of. P. Schindler. (*Zeit. Oeffent. Chem.*, **8**, 288, through *Chem. Centr.*, **1902** [2], 849.) 5 Gm. of the powdered mace is placed in a small extraction tube, plugged with a piece of cotton, and packed by well shaking down. It is then moistened with 7–8 c.c. of 98 per cent. ether. A second similar amount is added, and the percolate collected in a suitable receiver. The extraction tube is then placed over a second receiver, a second percolation is performed with the same amount of ether. The process is repeated a third time, the percolate being also kept apart. If a drop of lead acetate solution be now added to each of the percolates, in the case of Banda mace, the first will give a deep yellow to red precipitate, the second less and of a paler colour, while the third is unaffected or shows only a whitish precipitate. In the case of Bombay mace, or a mixture thereof with Banda mace, the colour in the second and third percolates increases in brightness and intensity. It is essential that the ether employed should not be weaker than 98 per cent.

Manganese Dioxide, Pure Medicinal, Method of Preparation. A. Gotthelf. (*Amer. Journ. Pharm.*, **75**, 215.) The method adopted consists in precipitating the oxide from a solution of manganese sulphate, through the addition of a mixture of ammonia and hydrogen peroxide.

For this purpose 250 c.c. each of solution of ammonia (10 per cent.) and hydrogen dioxide (3 per cent.) diluted to the volume of 1,000 c.c. are added, with constant stirring, to a solution of 50 Gm. of crystallized manganous sulphate in 1,000 c.c. of water. After washing several times by decantation, the precipitate is transferred to a filter, the washing continued until free from sulphate, and dried at 150°C.

If the manganese is poured into the alkaline solution, the proportion of dioxide produced falls below 43 per cent., with a corresponding increase in the quantity of manganoso-manganic oxide. The dioxide in the dry product was determined by means of standard oxalic acid and permanganate in the usual manner, while the total manganese was found by converting into the sulphate through heating with a slight excess of sulphuric acid,

repeating the operation until all the oxide has been converted into a white manganous sulphate of constant weight.

It is impossible to remove all the water of hydration from the precipitated oxide; for even at 210°C., a temperature at which the precipitate begins to lose oxygen, some water is still retained. It was found that a temperature of 150°C. was sufficient to remove a greater percentage of the water without danger of converting the precipitate into the manganoso-manganic oxide. The precipitate approximates the following composition: $4MnO + 20$ to $25\ MnO_2$.

Mercury Idoocacodylate, Subcutaneous Injection of. (*Merck's Report*, **1902,** 8.) Mercury cacodylate, although undoubtedly of great therapeutic activity, is unstable, and when injected subcutaneously gives rise to acute pain. Ciavette and Frasse have therefore recommended the use of the iodocacodylate, the hypodermic injection of which is thus prepared: Mercuric cacodylate and cacodylic acid 2, are dissolved in distilled water 75. Sodium iodide 1, is dissolved separately in distilled water 5. This solution is added to that of the mercury salt; the mixture is then neutralized with dilute NaOH solution and the volume adjusted to 100 fluid parts. The solution thus obtained keeps indefinitely, and may be sterilized by heat without undergoing decomposition. Each c.c. contains 3 Cgm. of mercury iodocacodylate, which is equivalent to 4 Mgm. of mercury biniodide. The dose is 1 c.c., which should be injected into the gluteal region on alternate days. The injections are stated to be painless, and have given good results in the treatment of syphilitic affections.

Mesotane. (*Therap. Monats.*, **16,** 650.) Mesotane, salicylic acid methyl oxymethylic ester, $OH.C_6H_4.COOCH_2.OCH_3$, is obtained by treating sodium salicylate with dimethyl chlorine ether thus—

$$C_6H_4\left\langle\begin{matrix}OH\\CO_2Na\end{matrix}\right. + ClCH_2.O.CH_3 = NaCl + OH.C_6H_4.COOCH_2.OCH_3.$$

It forms an oily liquid with a faint odour. It is insoluble in water, by which it is decomposed, liberating salicylic acid, formaldehyde and methyl alcohol. This decomposition takes place partially even on exposure to atmospheric moisture. It is introduced as a substitute for methyl salicylate in rheumatism. It is generally administered by inunction in a vehicle of castor or olive oil.

H. Roeder (*Muench Med. Woch.*, **49,** 2077) has employed it, with success, in the treatment of rheumatic pains, both muscular

and articular. The painful part is painted over with mesotane, or a solution of mesotane in olive oil, by means of a brush or a pad of wool. The spot is then covered over with a piece of flannel or silk. Relief is often immediate. In 40 cases thus treated, the author only met with failure in 2 chronic cases of long standing.

Methyl Acetyl-salicylate. Huchard and Ambard. (*Journ. des Pract.*, through *Répertoire* [3], **15**, 116.) This body, $C_6H_4:(OCOCH_3)_2$, is formed by the acetylization of methyl salicylate. It occurs in insoluble, odourless crystals, m.p. 48°C. It is split up on contact with alkali, into the alkaline salicylate and acetate. It is given in place of sodium salicylate, in rheumatism and other affections in which that salt is prescribed, in daily doses of 75–125 grains, in which quantity it is stated not to give rise to tinnitus, and the other unpleasant effects of the alkaline salicylates.

Methyl Iodide as a Vesicant. C. Garnier. (*Répertoire de Pharm.* [3], **15**, 216.) Methyl iodide is recommended as an active reliable vesicant and counter-irritant, which is free from the disadvantages of cantharides. A double fold of filter paper, moistened with 2 or 3 Gm. of the liquid, is applied to the part, which has previously been washed, and rendered antiseptic with phenol or sublimate solution. The wet pad is covered with a piece of gutta-percha tissue of slightly larger size; a layer of lint, the edges of which are kept in position by means of collodion, is placed on top. After leaving the dressing on for 8 or 10 hours, it is removed and the resulting blister opened with the usual precautions to ensure asepsis, and dressed with vaseline and boric acid. The application occasions a sharp smarting for 5 or 10 minutes, followed by a more or less freedom from pain. Ultimately a sensation of warmth sets in, which is not sufficiently painful to prevent sleep. With a smaller dose, erythema without vesication may be obtained.

Microsol. G. Fendler. (*Pharm. Zeit.*, **47**, 599 A new bactericide and antiseptic disinfectant for general domestic use for stables, drains, etc., has been introduced under this name. It is a green paste with a sulphurous odour, which is dissolved in water in the proportion 1:40 before use. It is a mixture of copper sulpho carbolate, copper sulphate, free sulphuric acid and water. A similar preparation may be obtained by heating phenol 5, with strong sulphuric acid 6, to 120–160°C. until a portion withdrawn is completely soluble in water; after cooling, the product is dissolved in water 10 saturated with powdered copper

carbonate and filtered. Copper sulphate 75 is then added to the filtrate, and sufficient water to make a thick paste. This is stated to form a most effective and cheap disinfectant when dissolved in water in the proportion of 2·5 : 100.

Milk Sugar and Magnesia as an Aperient. Huchard. (*Nouv. Rem.*, **18**, 335.) A mixture of milk sugar with calcined magnesia affords an excellent aperient, antacid and diuretic. Milk sugar 2, heavy magnesia 3, are mixed. A dessertspoonful or a tablespoonful of the powder is stirred up in half a tumblerful of water for a dose.

Mirmol. Ranelletti. (*Therap. Monats.*, **17**, 155.) This name, derived from μυρμηξ, an ant, in allusion to the production of formic acid from formaldehyde, is applied to a liquid preparation containing 10 per cent. of formaldehyde and 0·3 per cent. of phenol. It is introduced as an application for cancerous and other morbid growths. It is claimed to be antiseptic, hardening and hæmostatic. The affected parts are first washed clean with a 0·5–2 per mille dilution of mirmol, then dressed with a compress of absorbent wool moistened with a 1 : 9 dilution of the same in warm water, the dressing being covered with a sheet of gutta-percha tissue and left in contact for 24 hours. It is then taken off, the hardened parts removed and a fresh application of similar strength, or increased to 1 : 4 if desired, applied. The parts not required to come in contact with the dressing are protected with a coating of vaseline or glycerin. The applications are stated to have been effective in various forms of carcinoma, in lupus, ulcerous infiltrations and similar affections.

Mylitta lapidescens: Little Man's Bread. David Hooper. (*Pharm. Journ.* [4], **16**, 701.) This curious underground fungus is supposed to be allied to the truffles, and is used in Southern India as a food and medicine. It is much esteemed by native doctors for various complaints, and is regarded as diuretic. The Tamil name, according to Dr. Waring, is *Black Pallagum*, *Pallagum* signifying a medicinal substance. The fungus frequently appears on the Nilgiris, and the Badagas, Karumbars, and other hill tribes call it "God's bread," or "little man's bread."

In 1889 the fungus was very plentiful in the Government Cinchona Plantations at Naduvatum, and the specimens were found over a wide area about 1 foot beneath the surface of the ground. Tea planters on other parts of the hills, between 5,000 and 6,000 feet elevation, have noticed their periodical occurrence

on their estates, and the coolies are said to collect and cook them for their meals.

The fungoid bodies are like small tubers, having a black, finely wrinkled surface; the inside is white, and marked with veins; a section under the microscope shows the division of the tissue to be similar to that exhibited by other hypogæous fungi. In a fresh state they have a waxy consistence, but when dry they are hard and horny. Some fresh slices immersed in glycerin for several weeks showed no crystalline formations, and starch was entirely absent. The largest sized tubers, which are rounded or ovoid in shape, weigh about 10 Gm., while the smaller ones weigh only 1 Gm.

The dried fungus yields about 1 per cent. of carbonated ash. Boiled with dilute hydrochloric acid, a solution was formed which reduced Fehling's test. It was chiefly affected by boiling soda solution, which resolved it into a slimy mucilage. The composition of mylitta has been investigated by E. Winterstein, of Zurich, and the results appeared in *Archiv der Pharm.*, **233**, 398. The chief constituent is a slimy substance obtained by prolonged heating with alkali, which is similar to Tollen's carbohydrate, saccharo-colloid. The composition is as follows: Water, 4·56; ethereal extract, 0·10; protein substances, 2·36; analogues of chitin, 0·91; fungus cellulose, 2·80; saccharo-colloid, 88·98; ash, 0·20.

In the Simla Hills a truffle-like body is derived from *Melanogaster durissimus*, Cooke, which is similar to the "Little man's bread" of Southern India. It is, however, different in composition, as it contains a crystalline sugar, an odorous fatty principle, and about 8 per cont. of proteids. The base of the tuber consists of a carbohydrate forming a slimy mucilage when boiled with soda solution, and resembled saccharo-colloid in its properties.

Nargol. (*Merck's Report*, **1902**, 122, 467.) This name has been given to silver nucleinate. It is employed as an antiseptic, chiefly in ophthalmic practice, and is stated to be more penetrating than silver nitrate, more lasting in its action and less irritating than protargol. It is used in conjunctival inflammation and in corneal ulcer. It is usually applied in the form of a 10–20 per cent. aqueous solution.

Oresol. Lépine. (*Bull. Comm.*, through *Pharm. Zeit.*, **47**, 787.) This name has been given to the monoglycerin ester of

guaiacol. It is soluble in water 1:40, very soluble in alcohol, and may be given in doses of several Gm. per diem, in those cases in which creosote or guaiacol are indicated. It is less active, however, than guaiacol carbonate.

Peach Kernel Oil, Detection of, in Fixed Oil of Almonds. A. Chwolles. (*Pharm. Zeit.*, **48**, 109, after *Chem. Zeit.*) The following modification of Kreis's test is employed to detect the substitution of peach kernel oil for almond oil, or the admixture of the two. An equal volume of the oil is poured upon strong HNO_3, sp. gr. 1·4; to this a similar volume of a 1 per mille ethereal solution of phloroglucin is added. The whole is well shaken. Peach kernel oil shows an intense raspberry-red colour, inclining to violet. Pure almond oil gives only a pale rose tint. The admixture of 10 per cent. of peach kernel oil with almond oil may be detected by comparing the tint given with that of a blank experiment, using pure almond oil.

Perdynamin. O. Kronheim. (*Deut. Med. Woch.*, through *B.M.J. Epit.*, **1902** [2], 32.) Perdynamin is an animal iron preparation containing albumin, and therefore to be regarded as nutrient as well as an iron-containing body. It is said to be completely digestible, and its nutrient capabilities are double that of hen's eggs. Its pleasant taste renders it a very valuable form of medicament, and in anæmic and chlorotic conditions it improves the general condition and also increases the iron value of the blood. The appetite is quickly improved, and it has been found of use in phthisis and during convalescence. It is also of great benefit in the vomiting of pregnancy. In this condition the preparation appears superior to all the other remedies. Perdynamin is a fluid, and is to be given either alone, or diluted with wine, tea, or mineral water. It should be taken half-an-hour before meals in doses of a liqueur glassful; for loss of appetite, 1–2 tablespoonfuls, undiluted, a day; and for children, 1–2 teaspoonfuls may be given.

Phenol Poisoning, Alcohol as an Antidote for. (*Pharm. Journ.* [4], **15**, 85.) J. A. Kelly reported favourably on the administration of alcohol as an antidote to carbolic acid, and G. W. Sargent subsequently (*Therapeutic Gazette*, **25**, 797) published facts which, in his opinion, proved that alcohol is "the most perfect, the most certain, and the most handy antidote to carbolic acid that we possess." More recently J. L. Mizener (*Therapeutic Gazette*, **26**, 144) has given his experience in the matter, beginning with the statement that he saw a finger "burned" with

carbolic acid successfully treated by immersion in strong alcohol, with the result that no inflammation followed. He also gives particulars of a case in which a boy of about 3½ years old drank some carbolic acid, and spilled a lot of it on his chest and abdomen, which were whitened by it. When summoned to attend the case, Mizener found the little patient in a state of complete collapse, and he at once administered 2 drachms of pure alcohol, a second dose being given in a few minutes, and a third dose 15 minutes later. By that time the child had begun to recover from the collapse, and cloths saturated with alcohol were placed on the chest and abdomen. "Next morning the little fellow was in camp playing as though nothing had happened, only complaining of a little soreness where the acid had burned. In this case about 1½ ounces of alcohol were given internally, and about an ounce applied externally." Mizener gives entire credit for the recovery to the use of alcohol, nothing else having been employed in this case as an antidote.

Phenol-phthalein as a Purgative. F. W. Tunnicliffe. (*Brit. Med. Journ.*, **1902** [2], 1224.) The author has investigated the value of phenol-phthalein as a purgative, introduced into medicine under the name of "Purgen," and finds it to be a valuable and safe aperient. He thus summarizes his observations: For children, phenol-phthalein, in doses of from ¾–2½ grains, is a useful aperient. For adults, in ordinary cases, it must be given in doses of 1½–4½ grains. In obstinate constipation this dose must be increased up to 15 grains. Phenol-phthalein produces purgation in jaundice; it has no irritant action on the kidneys, and its depressant action is less than that of magnesium sulphate. It does not appear to lose its effect after repeated administration. It is generally administered at night, in the form of tablets. (See also *Year-Book*, **1902**, 200.)

Picric Acid Applications in Small-pox. (*Merck's Report*, **1902**, 11.) J. F. Romero has obtained good results with picric acid solution 1 per cent., applied 2 or 3 times daily to the pustules, with a brush. The solution employed was thus composed: Picric acid, 2; alcohol 90 per cent., 15; water, 185. In confluent suppurative cases the solution is replaced by the following ointment: Picric acid, 5; alcohol 90 per cent., 4; lanoline or liquid vaseline, 200. To be applied 4 times daily.

Picric Acid, Danger of Extensive Applications of. Manseau. (*Journ. Pharm. Chim.* [6], **16**, 269.) Although the 1 per cent.

solution of picric acid is of undoubted service as an application to burns and scalds, the author points out that its employment in large quantity to an extensive burn may give rise to toxic symptoms by absorption. He cites a case of a severe scald in a young child, which was treated for some days with this solution, in which symptoms of toxic action were developed, the healthy skin becoming red, and the urine orange-red, as if charged with bile pigments. The presence of picric acid in the urine was thus demonstrated: 100 c.c. was evaporated to 20 c.c., acidified with a few drops of HCl, filtered, and shaken out with amylic alcohol. The alcoholic layer was removed, allowed to evaporate spontaneously in a small porcelain capsule. On adding a few drops of KCN solution to this residue and gently warming, the red colouration due to picrocyanic acid was obtained. On discontinuing the picric acid dressings and substituting aristol, the toxic symptoms ceased, and the patient made a good recovery.

Podophyllum peltatum and P. emodi, Notes on the Resins of. D. B. Dott. (*Pharm. Journ.* [4], **16**, 460.) Commenting on the history of podophyllin, it is noted that the resin precipitated from alcoholic extract of the rhizome of *Podophyllum peltatum* with water has been in medicinal use for many years, and has been a subject of investigation from the pharmacological, chemical, and pharmaceutical points of view. Power, thirty years ago, found the ether-soluble portion of the resin to be by far the more active. This was confirmed by Klump. Podwissotski (*Year-Book*, **1882**, 154) made a more elaborate investigation of the resinoid, finding its activity to be due to a crystallizable, very poisonous principle, which he named podophyllotoxin. By treating this substance with ammonia, two compounds were obtained; one of these, picropodophyllin, being chemically indifferent, poisonous, and intensely bitter; the other, podophyllic acid, combines with the alkali, and when liberated is found to dissolve in hot water, giving a solution strongly acid to litmus. Podwissotski's results have, in the main, been confirmed by Dunstan and Henry, and by J. C. Umney. The yield of resin varies greatly, as stated by different observers, from 1·6 to 6·6. Lohman (*Year-Book*, **1897**, 128) states that no resin is found in the fresh rhizome, but that it is developed after drying, and only reaches its full amount after two years. Assuming this statement to be correct, it may partly account for the discrepant yields. The variation would be of little importance unless it were proved that the proportion of podophyllotoxin also varies, but that does not appear to have been

demonstrated. At present the British Pharmacopœia contents itself with the requirements of solubility in alcohol and in ammonia water, and that the ash must not exceed 1 per cent.

Judging from papers that have from time to time appeared, there must be considerable difficulty in preparing podophyllin to attain the official standard. It has been noted by more than one writer that the use of alum or other aluminium salt in precipitating the resin, in order to obtain a fine yellow colour, is responsible in many cases for increased ash and increased insolubility in spirit. The employment of too high a temperature in drying is also credited with being a source of mischief. In a sample of podophyllin carefully prepared, but under ordinary conditions of precipitation and drying, the ash was equal to 0·9 per cent. The percentage insoluble in alcohol was 2·1. It is thus evident that the B.P. limit of ash is not excessive, and that it might properly allow 3–4 per cent. as insoluble in spirit. It is equally certain that there is no excuse for large percentages of insoluble matter and ash.

The resin from *Podophyllum emodi* has received a fair amount of attention, and has been rendered "official" so far as the Indian and Colonial Addendum is concerned. It was at first said to be equally active, if not more so, than the resin of *Podophyllum peltatum*, but later experience has not confirmed that opinion. However, Dunstan and Henry and J. C. Umney agree that the active principles of both are the same. Consequently, it is very probable that the resin of *P. emodi* may be treated in some way to render it therapeutically equivalent to that of *P. peltatum*, and to answer all the official tests. The B.P. requires solubility in solution of ammonia. This test the ordinary resin almost completely answers, while that of *P. emodi* becomes a gelatinous mass. When this mass is collected on a filter and repeatedly washed with dilute ammonia solution, more than half remains undissolved. This dries to an amorphous substance not dissolved by dilute acids or alkalies. It is neutral to litmus, and is not hydrolized by dilute HCl. It is practically insoluble in ether, but is soluble in chloroform and in acetone, from which it separates in the form of white crystals, m.p. 212°C.

It is evident that the substance is picropodophyllin, and the amount of the purified crystalline compound was 3·73 Gm. from 100 Gm. of rhizome. The filtrate and ammoniacal washings were mixed with acid in excess, and the precipitate, after washing with cold water, dried and weighed. It amounted to 2·04 Gm.

Notwithstanding the able work that has been done on this subject there is a certain amount of obscurity about the chemistry of podophyllin. Some books state that podophyllotoxin is the active principle, others picropodophyllin. Podwissotski seems to have held that podophyllotoxin is a combination of picropodophyllin with podophyllic acid, but Dunstan and Henry indicate that the picro compound is obtained by hydrolysis, and cannot be re-formed as it originally existed. At the same time, although the picropodophyllin is stated to be poisonous, its pharmacological value and relationship to podophyllotoxin have not been clearly stated. The question arises as to whether picropodophyllin exists ready formed in the *P. emodi* resin or whether dilute ammonia in the cold is capable of producing it. This much is certain, that the gelatinous mass formed by treating the resin of *P. emodi* with ammonia solution consists almost entirely of a compound having the properties attributed to picropodophyllin, and that it forms about half of the total resinoid precipitate, and that it cannot exist in the same form as in the American resin.

[With reference to the comparative activity of the resins of *Podophyllum peltatum* and of *P. emodi*, it may not be without interest to mention that in two cases, as well as in our own *corpus vile*, gradually increased doses of the freshly precipitated resin of *P. emodi* have been absolutely inert even when amounting to 3 grains! The resin in question, prepared from recently imported root of *P. emodi*, was that investigated by J. C. Umney.—Ed. *Year-Book*.]

Podophyllum Resin. S. Taylor. (*Pharm. Journ.* [4], **15,** 368.) A variety of opinion as to the conditions which a genuine sample of resin of podophyllum should fulfil has been expressed from time to time. Podwissotski (*Year-Book*, **1882,** 154) gives no figures by means of which one can identify a genuine sample, but he remarks that the resin is soluble in 80–95 per cent. alcohol, and that the dark-brown or grey-brown preparations prove to be the most impure.

Jones (*Year-Book*, **1889,** 179) found that a typically pure specimen was quite soluble in 90 per cent. alcohol, that the percentage of ash was 0·2, and that the chloroformic extract washed with petroleum ether was 51·6 per cent. He also states that the ash percentage of a good sample will vary between 0·2 and 1·2.

Kremel (*Year-Book*, **1889,** 180) assays podophyllin by extracting with cold chloroform, evaporating and pouring into petroleum

ether; commercial samples yield from 20–30 per cent. of "podophyllotoxin."

Thompson (*Year-Book*, **1890**, 147) states that the average amount of "podophyllotoxin" in the American resin varies from 40–45 per cent.

Umney (*Year-Book*, **1892**, 398) states that he obtained a yield of 33·8 per cent. of this crude podophyllotoxin.

Gravill and Sage (*Year-Book*, **1894**, 177) are of the opinion that good sample will be almost entirely soluble in rectified spirit, and will yield an ash of 0·5 per cent.

Squire (*Squire's Companion*, 500–551) states that at least 50 per cent. of the resin should be soluble in chloroform, that there should not be more than 10 per cent. insoluble in alcohol 90 per cent., and that the amount of ash should not exceed 2 per cent.

Quite recently Gordin and Merrell (*Year-Book*, **1903**, 236) have stated that pure podophyllin should be completely soluble in cold alcohol, that it should contain about 64 per cent. ether-soluble and about 74 per cent. chloroform-soluble matter, and that there should be a yield of about 22 per cent. of crude picropodophyllin.

It would appear from these statements that an accurate analysis of the resin could be made by means of one or two estimations—viz., the ash determination, the estimation of the solubility in alcohol 90 per cent., and in chloroform, and the determination of the chloroform extractive washed with petroleum ether (the crude podophyllotoxin mentioned above). If we add to these tests the solubility in solution of ammonia, the solubility in pure ether, and the determination of the ether extractive washed with petroleum ether, we have a scheme of analysis which should indicate the value of any sample.

Thirteen samples have been collected from various sources, and treated, except in one or two cases where the quantity was too small, with all the above tests. The results are embodied in the accompanying chart:—

It will be seen that four of the samples cannot be considered as fulfilling the conditions required, the high percentage of ash, the insolubility in alcohol, and the nature of the "podophyllotoxin" justify the exclusion of No. 10.

The following facts appear to be warranted by the resulti:—

1. That the pharmacopœial standard of 1 per cent. of ash is justifiable.

2. That the solubility test in solution of ammonia is not of much value.

Number of Sample.	Description of the Resin.	P.c. of Ash.	P.c. insoluble in Alcohol 90 p. c.	P.c. insoluble in Solution of Ammonia.	P.c. insoluble in Chloroform.	P.c. of Chloroform Extract washed with Petroleum Ether.	Character of the same.	P.c. insoluble in Pure Ether.	Character of the Residue.	P.c. of Ether Extract washed with Petroleum Ether.	Character of the same.	General Remarks.
1	Very dull yellow.	0·4	0·2	—	45·3̇	46·6̇	Cream coloured Powder.	43	Sticky, drying to a dark resin.	43·3	Brittle brown mass.	The ash contained Iron.
2	Dull light yellow.	0·4	2	4·4	34	53	Do.	30	Do.	60	A mixture of brownish masses and a yellow powder.	The ash contained Copper.
3	Dull light yellow.	0·4		1	34	50·5	Do.	28·2	Do.	52·5	Do.	The ash contained Copper.
4	Dull greyish green.	0·4	2·2	6	36	47	Do.	35·2	Do.	44·5	Do.	The ash contained Iron.
5	Deep bright yellow.	0·4	3	2·3	44·2	41	Do.	31	Powder with a slight admixture of resin.	58	Brittle brown mass.	—
6	Dark greenish yellow.	0·4	1·3̇	—	33·3̇	39	Do.	—	—	—	—	The ash contained Copper.
7	Dull greenish yellow.	0·5	0·8	0	33·8	47·5	Do.	29·8	Powder with a slight admixture of resin.	47	A mixture of brownish masses and a yellow powder.	The ash contained Iron.
8	Deep bright yellow.	0·6̇	2·4	3	42·6	46·6	Do.	35	Somewhat resinous but it did not form a mass.	58·5	Do.	—
9	Brown.	0·946	1·4	0.8	46·6	42·3̇	Do.	38	Do.	46·6	Do.	—
10	Greenish yellow.	1·3	6	0·2	41·8	50	Brown mass.	30·2	Powder.	44·5	Do.	The ash contained Iron.
11	Light bright yellow.	1·4	—	—	51·3̇	33·3̇	Cream coloured Powder.	—	—	—	—	—
12	Deep bright yellow.	1·6	10	1	53·3̇	39	Do.	40	Powder.	40	A mixture of brownish masses and a yellow powder.	—
13	Dull greenish yellow.	5·19	12·2	3	62	37·5	Do.	49·2	Do.	42·5	Do.	—

3. That the insolubility in 90 per cent. alcohol should not exceed 5 per cent.

4. That Squire's limit of 50 per cent. soluble in chloroform is a good criterion.

5. That at least 40 per cent. of the original resin should be precipitated from the chloroformic solution by petroleum ether.

6. That 60 per cent. should be soluble in pure ether and that the residue should consist principally of a resinous and sticky body.

Millard's H_2SO_4 test (*Year-Book*, **1898**, 181) was applied to all the samples, and his KOH test to all except Nos. 6 and 11. The results showed that the resin of *P. emodi* is not substituted for the official substance, but how far partial substitution may be carried on does not appear.

As regards the solubility in alcohol, it is interesting to note that the authorities mentioned in the first part of the paper find that their standard samples are soluble, whereas the commercial article is not so. We may conclude from this that the solubility depends on the age, especially when we take into consideration the statement of Lohman (*Year-Book*, **1897**, 369) that the resin is not found in the fresh rhizome, but develops after it has been dried. It is impossible to say as yet how far alteration does take place, but the case seems to warrant inquiry.

Podophyllum Resin, Commercial. A. R. Bennett. (*Pharm. Journ.* [4], **16**, 238.) With a view to ascertain how far the commercial varieties of podophyllum resin correspond with the B.P. characters, 10 samples were obtained from various sources and were examined as follows:—

1. *Solubility in Alcohol 90 per Cent.* 1 Gm. was weighed and mixed with 20 c.c. of the alcohol, and filtered into a previously tared platinum evaporating basin. The alcohol was driven off by the heat of a water-bath, and the residue, when it ceased to lose weight, was weighed, and the percentage solubility calculated accordingly.

2. *Percentage of Ash.* 1 Gm. was weighed and incinerated in a previously tared platinum crucible until it ceased to lose weight. The crucible was afterwards cooled in a desiccator and weighed again, the necessary calculation being made for arriving at the percentage of ash.

3. *Solubility in Ether.* This was done as in the case with alcohol 90 per cent.

The results may be tabulated as follows:—

Number.	Source.	Solubility in 90 per cent. Alcohol.	Solubility in Ether.	Ash percentage.	Colour.
1	British	80 per cent.	77· 5 per cent.	2·31	Orange.
2	Foreign	84 „	76· 2 „	2·73	Yellow.
3	Foreign	90 „	73· 1 „	2·90	Pale yellow.
4	British	98 „	71·52 „	2·10	Pale orange.
5	British	95 „	73 ·0 „	0·75	Pale orange.
6	Foreign	90 „	70· 0 „	1·43	Pale orange brown.
7	Foreign	94 „	68· 0 „	1·64	Deep yellow.
8	British	88 „	69· 0 „	1·90	Orange brown.
9	British	90 „	74· 0 „	1·89	Deep orange brown.
10	British	86 „	76· 0 „	1·75	Orange brown.

It will be observed from these results that resin of podophyllum soluble, or nearly so, in alcohol 90 per cent. is not a plentiful article in the market, as none of the above samples can be described as "soluble, or nearly so, in alcohol 90 per cent."

From experiments already made, it appears that the degree of heat used in drying the resin, and its being exposed to the air while being dried, has a very strong action upon it by oxidizing and rendering it, therefore, insoluble.

Podophyllum Resin, Examination of. H. M. Gordin and C. G. Merrell. (*Proc. Amer. Pharm. Assoc.* **50**, 343.) The following method is proposed for the assay of podophyllum resin: Weigh out 5 Gm. of the resin into a strong round bottle holding about 200 c.c., add to it about 10 Gms. of freshly prepared calcium hydrate, close the bottle with a good cork, and weigh the whole. Now uncork the bottle and put it into a water bath heated to 60–65°C. for a few minutes, then pour in 15 c.c. of alcohol, close the bottle, shake well, replace the bottle in the water bath, and keep it there closed for 8 hours, shaking at first every few minutes to prevent formation of a hard lump. After half-an-hour it is only necessary to shake the mixture about every quarter of an hour. After the lapse of 8 hours the bottle is cooled, and about 7 c.c. of chloroform added to the contents. The bottle is next placed on a balance and sufficient of a mixture of 2 parts alcohol and 1 part chloroform (by volume) is poured into the bottle to make the whole liquid added weigh 130 Gm. The bottle is shaken a few minutes and set aside until the supernatant liquid becomes perfectly clear, which takes about 24–48 hours. 65 Gm. of the

clear liquid is then drawn off into a tared vessel by placing the latter upon a balance and forcing the picropodophyllum solution into it by means of an arrangement similar to a Spritz bottle fitted to the bottle in which the podophyllum resin has been digested; finally, the liquid is removed by distillation and the residue dried and weighed.

Poppy Capsules, Morphine Content of. G. Fromme. (*Cæsar and Loretz's Report*, **1902**, through *Annales de Pharm.*, **8**, 498.) By extraction with the Stas-Otto method commercial ripe poppy capsules gave 0·0189 per cent. of morphine. Capsules gathered and dried before ripe, and cut longitudinally, freed from seeds, yielded 0·133 per cent., and those gathered unripe and dried whole, 0·144 per cent. The dried unripe fruits therefore contain more than 7 times as much morphine as the ripe capsules, an important difference, in view of the widespread use of the drug as a domestic remedy.

Purgatin. (*Merck's Report*, **1902**, 140.) Subsequent experiments with purgatin, anthrapurpurin acetate, which was first introduced as an aperient (*Year-Book*, **1902**, 202), do not indicate that the preparation is likely to supplant established aperients. C. R. Marshall points out that in small doses it discolours the urine; in large ones it causes irritation to the kidneys. Jukowsky, from the results of experiments on children, finds nothing in purgatin to warrant its preference over fluid extract of cascara sagrada.

Pyranum. Schlesinger. (*Therap. Monats.*, through *Répertoire* [3], **15**, 121.) This name has been given to benzoyl thymyl-sodium benzoyloxybenzoate. It is a white, crystalline powder, with a sweetish taste; soluble in water to the extent of 1 : 5. Schlesinger reports that it is very efficient in the treatment of neuralgias and migraine, in doses of 30–60 grains per diem. In acute rheumatism daily doses of 50–60 grains, repeated for 3 days, caused the disappearance of fever and pain. Chronic rheumatism is favourably influenced by doses of 7½–22 grains repeated thrice daily. It is stated to be free from undesirable secondary effects.

Pyridine Tannate. (*Journ. Pharm. d'Anvers*, **58**, 417.) This compound combines astringent properties with the action of a uric acid solvent. It is obtained by pouring a solution of pyridine into an excess of tannin solution, the temperature not being allowed to exceed 10°C. The white, granular precipitate thus

obtained is collected, washed with cold water, and dried at 20–25°C.

Quinic Acid Anhydride. "New Sidonal." (*Merck's Report*, **1902**, 4.) Under the name "new sidonal" quinic anhydride has been introduced as a substitute for piperazine quinate, or "sidonal" in the treatment of gout. Quinic anhydride is a white, crystalline powder, freely soluble in water, and possessing a pleasant taste. In the presence of dilute acids and alkalies, it forms quinic acid, so that when passing through the stomach and intestines that acid is liberated in the active nascent-state. Not only does the quinic acid thus formed appear to act as an analgesic and anti-neuralgic, but it also has a marked inhibitory action on the formation of uric acid. The dose is 35–75 grains in 24 hours, which may be given in single doses of 35 grains.

Rhubarb, Chinese, Active Principles of. A. Tschirch and K. Heuberger. (*Archiv der Pharm.*, **240**, 596.) The active principles of rhubarb may be divided into two groups: tannoglucoside, derived from a peculiar tannin, rheotannic acid; and anthraglucosides, which are anthracene derivatives. These two groups are found, side by side, in the plant, and are accompanied by their respective decomposition products. The glucosides are found chiefly in the acetone extract of the root, the decomposition products in the ethereal extract. The anthraglucosides comprise chrysophanic acid, which is a dioxy-methyl-anthraquinone; emodin, a trioxymethyl-anthraquinone; and rhein, which is the methylene ester of tetraoxy-anthraquinone. All these glucosides are purgative. Tannoglucoside is formed from the union of a lævo-rotatory sugar with rheotannic acid. It is the "rhubarb red" of some authors. Ammoniacal extracts of rhubarb contain rheonigrin, which appears to be a condensation product of the anthraglucosides. Reviewing the nomenclature of the various constituents of rhubarb isolated by other workers, the authors state that the double glucoside of Aweng is identical with tannoglucoside. Frangulic acid is a decomposition product of this glucoside, impure with traces of anthraglucosides. Kubly's rheotannic acid and Hunkel's tannoid are identical with rhubarb red. Schlossberger and Dopping's aporhetin and phæorhetin are tannoglucoside rendered insoluble; erythrorhetin is a mixture of chrysophanic acid, emodin and rhein. The cathartic acid of H. G. Greenish, Elborne and Dragendorff is a mixture of anthraglucosides, a little tannoglucoside and a nitrogenous

substance, probably of an albuminoid nature. Gilson's chrysophan is an anthraglucoside.

Rhubarb, Chinese, Constituents of. E. Gilson. (*Comptes rend.*, **136**, 385.) Both free and combined cinnamic acid is present in rhubarb root. The tannin of rhubarb is not a simple body; the so-called rheotannic acid has been separated into 3 crystalline tannins. These comprise glucogallin, $C_{15}H_{16}O_{10}$, which, when hydrolized, gives a molecule of glucose and one of gallic acid; tetrarin, $C_{32}H_{32}O_{12}$, which hydrolizes into glucose, gallic acid and cinnamic acid; and a new aldehyde, rheosmin, $C_{10}H_{12}O_2$, occurring in long needles, melting at 79·5°C. This has the characteristic odour of rhubarb. Another tannin, a catechin, is also present.

Rhubarb, European and Chinese. S. Jakabhazy. (*Oesterr. Zeit. für Pharm.*, **56**, 553.) The comparative figures for chrysophanic acid, emodin and alcoholic ammonia extractive, show that Chinese rhubarb gives markedly higher results, while at the same time its ash is much higher than that of roots of European growth:—

Kind of Rhubarb.	Chrysophanic Acid.	Emodin.	Ammonic Alcoholic Extract
Chensi Root	3·71 per cent.	1·70 per cent.	47·3 per cent.
Canton picked	3·07 "	1·48 "	41·2 "
Shanghai picked	2·92 "	1·31 "	39·5 "
English, with pith	1·86 "	0·50 "	36·3 "
" without pith . .	0·80 "	0·38 "	33·5 "
French, flat, sliced	0·74 "	0·38 "	31·2 "
Austrian, round	0·70 "	0·47 "	30·7 "
" flat, without pith .	0·54 "	0·41 "	27·5 "

Richeria grandis, Constituents of the Bark of. P. Lemaire. (*Répertoire* [3], **14**, 496.) The plant producing the bark was first named *Chalufouria racemosa*, but has since been identified with *Richeria grandis*. It occurs plentifully in the Antilles, where the infusion of the bark is regarded as a powerful aphrodisiac. The bark, as received, gave no indication of the presence of alkaloids. After extraction with petroleum ether, alcohol removed a crystalline body forming prisms and hexagonal lamellæ, melting at 237°C. This was found to be without any aphrodisiac action. No other constituent of interest was detected. It is concluded that either the bark must lose its therapeutic activity on drying, or the supposed effect must be due to auto-suggestion.

Rodagene. (*Journ. Pharm. d'Anvers*, **58**, 419.) For some time it has been known that patients suffering from Basedow's disease have derived great benefit from taking daily a pint of goat's milk, derived from animals whose thyroid glands have been removed. It is found that after a while the stomach refuses this milk, Rodagene has been prepared to obviate this difficulty. It consists of the dried residue of thyroidless goat's milk mixed with an equal part of lactose. It is given daily in doses of 75–150 grains.

Salocreol. (*Pharm. Zeit.*, **48**, 203.) Under this name a compound of salicylic acid with the active phenols of beechwood creosote has been introduced. It is an oily, brown, almost odourless liquid, neutral in reaction, free from the acridity and toxic action of creosote, as well as the keratinizing action of salicylic acid. It is used both internally and externally by painting on the epidermis. For external use from 75–200 grains, or even more, a day may be thus applied as a pigment, or rubbed into the skin, in cases of rheumatism or gout. Similar applications are useful in glandular affections, phthisis, influenza, and all other cases in which either the action of guaiacol, or of salicylic acid, is indicated.

Santheose. Huchard. (*Répertoire* [3], **15**, 164.) Santheose is simply another name for theobromine. It is administered either alone or as phosphated santheose, consisting of santheose and sodium phosphate, or combined with lithium carbonate in the proportion of 1 of the former to 2 of the latter, or combined with caffeine in such cases as require a cardiac stimulant. The dose is the same as for theobromine: 8 grains twice to four times in 24 hours.

Sodium Di-iodo-salicylate. Frolo. (*Archives Therap.*, through *L'Union Pharm.*, **43**, 499.) This compound, one of the many iodoform substitutes, has been found to be of great value in the treatment of soft chancre. It is employed as a dusting powder in a 2, 10, or 50 per cent. dilution with talc. The author claims that complete cures have been attained in numerous cases thus treated. The powder has the advantage of being odourless.

Standards for Medicines. J. C. Umney. (*Pharm. Journ.* [4], **15**, 492.) In the course of an important paper on the standardization of drugs, the following limits were suggested for adoption as standards:—

(1) Standards of Purity.

(a) Chemicals.

Dangerous Metallic Contamination.

The principal danger in chemicals used in medicine may be briefly stated to be arsenic, copper, and lead.

Arsenic.

The scare with regard to the contamination with arsenic of certain things, including B.P. articles, is fresh in the memory, and it is therefore desirable to consider the products in which this metal may exist, as well as the limits (if any) that should be permissible.

Glycerin. The only instance in which the Brit. Pharm., 1898, prescribes a limit of arsenical contamination is in the monograph for glycerin, wherein Siebold's modification of Gutzeit's test is given to indicate, approximately, 1 part of arsenic in 250,000 parts of glycerin, this being a perfectly safe limit.

Sulphuric Acid. Attention has been directed to the possible presence of arsenic in all bodies in the production of which "pyrites" sulphuric acid is employed; also in bodies prepared under certain conditions with fuel containing volatile arsenical compounds, the one of principal interest to the pharmacist being the various products of malted grain.

Phosphates. The presence of large quantities of arsenic in sodium phosphate, and other phosphates until recently met with in commerce, makes it necessary that a limit of arsenic should be stated for medicinal phosphates. 1 part in 25,000 should not be exceeded.

It will be remembered that the British Pharmacopœia, 1898, requires the absence of arsenium in phosphate of ammonia, but does not make a similar requirement in the case of the sodium salt.

Of other articles used in medicine the following are those that have been found to contain variable quantities of arsenic :—

Liquor Ferri. Perchlor. fort. Arsenic can be without difficulty eliminated, and this condition should be insisted on.

Antimony Compounds, especially sulphide of antimony. The United States Pharmacopœia describes a limit for purified sulphide of antimony equivalent to 0·1 per cent. of arsenic, which seems to be by no means an unreasonable requirement.

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Reduced Iron. Attention has been recently called to the presence of arsenic and copper in reduced iron, but probably the case has been very much overstated as regards arsenic, the indications of Gutzeit's and similar tests have been misunderstood, and the proportion present much exaggerated. As, however, it appears almost impossible to prepare a reduced iron absolutely free from arsenic, there would be no harm in naming a limit of impurity which might be fixed at 1 part in 2,000. (See *Year-Book*, **1901**, 452.)

Copper.

The subject of contamination with copper is interesting chiefly to food analysts, as in some of these products it is not an uncommon contaminant.

Galenical preparations must, however, be carefully examined for this impurity, as instances have been recorded where extracts of an acid character, especially green extracts made from fresh herbs, have contained notable quantities of copper through manufacture in plant made of that metal. The quantity present certainly should not exceed 1 part in 15,000.

It should not be forgotten that nux vomica seeds, and possibly other drugs, naturally contain small quantities of copper.

Reduced Iron contains, as a rule, traces of copper, but not in such proportion as to be dangerous to health; yet the limit should be fixed at 1 part in 5,000.

Lead.

Citric and tartaric acids contaminated with lead have been the subject of much consideration, and the matter was brought to an acute stage ten years ago by the prosecutions under the Sale of Foods and Drugs Acts in the Woolwich district. Although the subject was then most ably investigated and reported on by Warrington and others, it cannot even now be said to be in quite a satisfactory condition.

Since the accurate determination of the amount of lead in citric and tartaric acids is extremely difficult, especially in the presence of traces of iron, a definite limit cannot easily be laid down. It is found in commerce that lead is present in practically all citric and tartaric materials, tartaric acid generally containing the most. The following test for these substances is suggested as being sufficient to exclude dangerous quantities of lead, whilst passing the best grades obtainable on the commercial scale:—

If to 1 Gm. of the acid dissolved in 5 c.c. of ammonia solution

(10 per cent.) 5 c.c. of saturated solution of sulphuretted hydrogen be added, this mixture should not acquire more than a slight yellowish coloration.

This test indicates the presence of lead in citric acid to the extent of about 1 part in 250,000, and in tartaric acid to the extent of about 1 part in 100,000.

Cream of Tartar. Attention has recently been called to metallic contamination in cream of tartar, which had hitherto escaped notice. The limit of lead in cream of tartar should be fixed by the test just described, which, with the same quantities of materials, ensures that the amount of lead present is not greater than 1 part in 200,000.

Tartarated Soda, and other tartrates, sometimes contain minute traces of lead, and limits of lead as impurity should be given for all tartrates and citrates.

(b) Drugs (Crude): Freedom from Admixture or Sophistication.

Percentage of Ash. The incineration of drugs affords one of the most valuable indications of normal character, as the percentage of ash and its chemical character often suffice by themselves to indicate impurity or sophistication.

The ash yields of drugs, as recorded in the British Pharmacopœia and in the appended table, are based upon the drugs themselves, and not the powders produced from them. This is important, for the loss in weight in producing powders differs according to the character of the drug, and may vary from 3 or 4 per cent. only in the case of hard barks, up to as much as 12–15 per cent. in the case of gum resins, where much volatile oil is dissipated in the process of drying and powdering. The percentages of ash recorded in the table are based upon the average result obtained in the examination of many samples of the best grades of the substances met with in commerce.

Roots and rhizomes of fibrous character, such as serpentary, hydrastis, and valerian, from their nature, have considerable proportions of soil adherent to them, and the ash obtained by incinerating such drugs comes out extremely high unless special precautions are taken to clean the drugs by brushing, etc.

In table "A" the percentage of ash recorded in the British Pharmacopœia, 1898, are included, whilst in the list of suggested standards certain modifications of these are added where considered necessary.

Table A.—Ash Standards.

Drug.	Ash Standard of B.P., 1898.	Suggested Ash Standard.
Acaciæ Gummi	Not exceeding 4 per cent.	Not exceeding 4 per cent.
Aconiti Radix	Not stated.	6 „
Aloe Barbadensis	„ „	8 „
„ Socotrina	„ „	8 „
Ammoniacum	„ „	7·5 „
Amylum	„ „	0·5 „
Anethi Fructus	„ „	8 „
Anisi Fructus	„ „	8 „
Anthemidis Flores	„ „	6 „
Araroba	„ „	7·5 „
Arnicæ Rhizoma	„ „	10 „
Asafetida	Not exceeding 10 per cent.	20 „
Aurantii Cortex	Not stated.	7 „
Belladonnæ Radix	„ „	7 „
Benzoinum	„ „	2 „
Buchu Folia	„ „	5 „
Calumbæ Radix	„ „	6 „
Cambogia	Not exceeding 8 per cent.	3 „
Cannabis Indica	Not stated.	15 „
Cantharis	„ „	7 „
Capsici Fructus	Not exceeding 6 per cent.	6 „
Cardamomi Sem	Not exceeding 4 per cent.	6 „
Carui Fructus	Not exceeding 8 per cent.	8 „
Caryophyllum	Not stated.	6 „
Cascaræ Sagradæ Cort	„ „	5 „
Cascarillæ Cortex	„ „	10 „
Catechu	Not exceeding 5 per cent.	5 „
Chirata	Not stated.	6 „
Cimicifugæa Rhizoma	„ „	10 „
Cinchonæ Rubræ Cortex	„ „	4 „
Cinnamomi Cortex	Not exceeding 6 per cent.	6 „
Cocæ Folia	Not stated.	8 „
Coccus	Not exceeding 6 per cent.	8 „
Colchici Cormus	Not stated.	8 „
Colchici Semina	„ „	5 „
Colocynthidis Pulpa	Not less than 9 per cent.	Not less than 10 per cent.
Conii Folia	Not stated.	Not exceeding 15 „
Conii Fructus	„ „	7 „
Coriandri Fructus	„ „	6 „
Crocus	Not exceeding 7 per cent.	7 „
Cubebæ Fructus	Not Stated.	7 „
Cuspariæ Cortex	„ „	9 „
Cusso	„ „	7 „
Digitalis Folia	„ „	10 „
Elaterium	„ „	14 „
Ergota	„ „	6 „
Eucalypti Gummi	„ „	0·5 „
Euonymi Cortex	„ „	10 „

TABLE A.—ASH STANDARDS, *continued.*

Drug.	Ash Standard of B.P., 1898.	Suggested Ash Standard.
		Not exceeding
Filix-Mas	Not Stated.	5 per cent.
Fœniculi Fructus	" "	10 "
Galbanum	" "	8 "
Galla	" "	8 "
Gelsemii Radix	" "	8 "
Gentianæ Radix	" "	5 "
Glycyrrhizæ Radix	" "	4 "
Granati Cortex	" "	15 "
Guaiaci Lignum	" "	2 "
Guaiaci Resina	" "	8 "
Hæmatoxyli Lignum	" "	2 "
Hamamelidis Cortex	" "	5 "
Hamamelidis Folia	" "	8 "
Hemidesmi Radix	" "	4 "
Hydrastis Rhizoma	" "	10 "
Hyoscyami Folia	" "	12 "
Ipecacuanhæ Radix	" "	5 "
Jaborandi Folia	" "	7 "
Jalapa	" "	6 "
Kino	" "	2 "
Krameriæ Triandræ Radix	" "	2 "
Krameriæ Argenteæ Radix	" "	2 "
Limonis Cortex	" "	5 "
Linum	Not exceeding 5 per cent.	5 "
Lobelia	Not stated.	12 "
Lupulinum	Not exceeding 12 per cent.	14 "
Lupulus	Not stated.	7 "
Mezerei Cortex	" "	4 "
Moschus	Not exceeding 8 per cent.	8 "
Myristica	Not stated.	4 "
Myrrha	" "	6 "
Nux Vomica	" "	2 "
Opium	" "	5 "
Papaveris Capsulæ	" "	10 "
Pareiræ Radix	" "	4 "
Physostigmatis Sem.	" "	4 "
Pimenta	" "	5 "
Piper Nigrum	" "	7 "
Pix Burgundica	" "	1 "
Podophylli Rhizoma	" "	5 "
Pruni Virginianæ Cortex	" "	6 "
Pterocarpi Lignum	" "	1 "
Pyrethri Radix	" "	5 "
Quassiæ Lignum	" "	4 "
Quillaiæ Cortex	" "	12 "
Rhei Radix	" "	12 "
Rhœados Petala	" "	16 "
Rosæ Gallicæ Petala	" "	4 "
Saccharum Lactis	Not exceeding 0·25 p. cent.	0·25 "
Sambuci Flores	Not stated.	10 "

TABLE A.—ASH STANDARDS, *continued.*

Drug.	Ash Standard of B.P., 1898.	Suggested Ash Standard.
Sarsæ Radix	Not Stated.	Not exceeding 8 per cent.
Sassafras Radix	" "	2 "
Scammoniæ Radix	" "	12 "
Scilla	" "	4 "
Scoparii Cacumina	" "	4 "
Senegæ Radix	" "	5 "
Senna Alexandrina	" "	14 "
Senna Indica	" "	14 "
Serpentariæ Rhizoma	" "	10 "
Sinapis	" "	5 "
Staphisagriæ Sem.	" "	15 "
Strophanthi Sem.	" "	5 "
Stramonii Folia	" "	15 "
Stramonii Sem.	" "	8 "
Styrax Præparatus	" "	0·5 "
Sambul Radix	" "	6 "
Taraxaci Radix	" "	7 "
Tragacantha	" "	4 "
Uvæ Ursi Folia	" "	4 "
Valerianæ Rhizoma	" "	10 "
Zingiber	" "	5 "

FREEDOM FROM ADMIXTURE OR SOPHISTICATION, AS SHOWN BY PERCENTAGE YIELD TO SOLVENTS.

TABLE B.—GUM RESINS, RESINS, ETC.

Substance.	Statement of British Pharmacopœia, 1898.		Suggested Standard.	
	Proportion.	Solvent.	Proportion soluble.	Solvent.
Ammoniacum	—	—	50 p.c.	Alcohol 90 p.c.
Asafetida	65 p.c.	Alcohol 90 p.c.	60 p.c.	Alcohol 90 p.c.
Balsam, Canada	—	—	90 p.c.	Alcohol 90 p.c.
Bals. Peruvianum	—	56·8 – 61·1 p.c. Cinnamein	60 p.c. cinnam.	
Bals. Tolutanum	Soluble	Alcohol 90 p.c.	sol.	Alcohol 90 p.c.
Benzoinum	Almost entirely soluble	Alcohol 90 p.c.	90 p.c.	Alcohol 90 p.c.
Cambogia	Completely soluble	Alcohol and water successively	75 p.c.	Alcohol 90 p.c.
Catechu	70 p.c.	Alcohol 90 p.c.	70 p.c.	Alcohol 90 p.c.

TABLE B.—GUM RESINS, RESINS, ETC., *continued.*

Substance.	Statement of British Pharmacopœia, 1898.		Suggested Standard.	
	Proportion.	Solvent.	Proportion soluble.	Solvent.
Eucalypti Gummi	80 – 90 p.c. Almost entirely	Cold water Alcohol 90 p.c.	—	—
Guaiaci Resin . .	—	—	90 p.c.	Alcohol 90 p.c.
Galbanum . . .	Not more than 10 p.c.	Ether	60 p.c.	Alcohol 90 p.c.
Jalapæ Resina . .	Not more than 10 p.c.	Ether	Not more than 10	Ether purificatus
Kino	Partially soluble	Cold water	75 p.c.	Cold water
	Almost entirely	Alcohol 90 p.c.	80 p.c.	Alcohol 90 p.c.
Myrrh	—	—	80 p.c.	Alcohol 90 p.c.
Scammony . . .	70 p.c.	Ether	—	—
Styrax Preparatus	—	—	—	Alcohol 90 p.c.

(2) *Standards of Efficacy.*

TABLE C.—DRUGS CONTAINING ALKALOIDS.

Drug.	Range of Alkaloidal, etc. Values.	Average Alkaloidal, etc., Value.	Suggested Standard.
Calabar Bean . . .	0·108 – 0·16	0·14	0·125 (Total alkaloids)
Coca	0·49 – 1·1	0·6	0·5 (Cocaine)
Cantharides	0·47 – 1·07	0·7	0·8 (Cantharidin)
Henbane	0·07 – 0·10	0·08	0·08 (Total alkaloids)
Stramonium Leaves .	0·39 0·44	0·42	0·4 (Total alkaloids)
Stramonium Seeds . .	0·2 – 0·46	0·41	0·4 (Total alkaloids)

TABLE D.—RESINOUS DRUGS.

Drug.	Solvent.	Character of Extractive.	Suggested Standard.
Podophyllum	Alcohol 90 per cent.	Precipitated Resin.	5·0 p.c.
Scammony	Alcohol 90 per cent.	Resin freed from sugar.	6·5 „
Capsicum	Dry chemically pure Ether.	Oleoresin.	15 „
Cubebs	„	„	22 „
Ginger	„	„	5·5 „
	Alcohol, 90 per cent.	Mixed extractive.	8·0 „

Percentage of Essential Oils in Drugs. Where fruits, such as anise and fennel, are practically used as flavouring agents only, it is of some importance that they should contain the full percentage of essential oil. In a paper read at an evening meeting of this Society (*Year-Book*, **1897**, 165) are set out the very varying proportions of essential oil contained in the different kinds of fennel met with in commerce. The proportion of essential oil varied from 0·75 in Indian fennel to as much as 4·5 in Galician and Russian varieties. The same observations apply to other umbelliferous fruits, such as anise, caraway, coriander, and dill. It is not feasible to suggest standards of essential oil for these fruits, as the proportion can only be determined by distillation of a considerable quantity and under fairly well-defined conditions; but none of the following fruits used in medicine can be said to have their full odorous or medicinal value unless they contain the proportions of essential oil stated:—

	Proportion of Essential Oil.
Anise	2 per cent.
Caraway	4 „
Coriander	0·5 „
Dill	3 „
Fennel	3 „

TABLE E.—ESSENTIAL OILS.

Oil.	B.P. 1898 Standard.	Active Medicinal or Odorous Constituent.	Suggested Standard percentage of Active Constituent.	Process for Determination.
Oleum Anethi	—	Carvol	45 p.c.	As in caraway oil
„ Anisi	—	Anethol	80 p.c.	Fractionation 225–235°C.
„ Cajeputi	—	Cineol	55 p.c.	Phosphoric
„ Carui	—	Carvol	55 p.c.	Fractionation 220–230°C., and phenyl-hydrazine comp.
„ Caryophylli	—	Eugenol	75 p.c.	Thoms
„ Cinnamomi	50 per cent. Cinnamic Aldehyde	—	—	Sodium acid sulphite
„ Eucalypti	—	Cineol	50 p.c.	Phosphoric acid
„ Lavandulæ	—	(English) Esters of Linalol	Not more than 11	Saponification
		(French) Esters of Linalol	Not less than 36	Saponification
„ Limonis	—	Citral	6·5 p.c.	Various
„ Menth. Pip.	—	Menthol	55 p.c.	Acetylation
„ Pimentæ	—	Eugenol	65 p.c.	Thoms
„ Santali	—	Santalol	90 p.c.	Acetylation
„ Sinapis	—	Allyl Sulphocyanide	98 p.c.	U.S.P. process

Standards of Efficacy of Galenical Preparations.

Table F.—Liniments.

Liniments.	Specific Gravity.	Average Extractive (Gm. per 100 c.c)	Average Alcoholic Strength (by Volume.
Linimentum Aconiti	0·860-0·875	5·25	82
„ Belladonnæ	0·875-0·895	5	71

Table G.—Concentrated Solutions.

Liquores.	Specific Gravity.	Average Extractive (Gm. per 100 c.c.)	Average Alcoholic Strength (by Vol.)
Liquor. Calumbæ Conc.	0·987–0·997	8·5	20
„ Chiratæ Conc.	0·990–1·00	4·5	19
„ Cuspariæ Conc.	1·010–1·020	10	19
„ Krameriæ Conc.	1·007–1·015	9	19
„ Picis Carb.	0·858–0·872	3	82
„ Quassiæ	0·976–0·980	0·25	19
„ Rhei	1·015–1·030	11·5	18
„ Sarsæ Co. Conc.	1·02 –1·04	9	19
„ Senegæ Conc.	1·01 –1·03	11	22
„ Sennæ Conc.	1·02 –1·08	12	18
„ Serpentariæ Conc.	0·990–1·00	4·5	19

Table H.—Liquid Extracts.

Liquid Extracts.	Specific Gravity.	Average Extractive (Gm. per 100 c.c).	Average Alcoholic Strength per cent. (by Vol.)
Extract. Belladonæ Liq.	0·890–0·925	13	68
„ Cascaræ Liq.	1·054–1·066	24	19
„ Cimicifugæ Liq.	0·875–0·890	10	78
„ Cinchonæ Liq.	1·115–1·130	42	12
„ Cocæ Liq.	0·995–1·08	19	50
„ Ergotæ Liq.	1·015–1·025	15	32
„ Hamamelidis Liq.	1·025–1·040	21	84
„ Hydrastis Liq.	1·025–1·040	22	89
„ Ipecac. Liq.	0·885–0·915	10	78
„ Jaborandi Liq.	1·020–1·050	22	84
„ Glycyrrh. Liq.	0·114–1·135	42	17·5
„ Nucis Vomicæ Liq.	1·945–0·965	12	61
„ Opii Liq.	0·985–0·995	8	18·5
„ Pareiræ Liq.	1·025–1·050	19	22
„ Sarsæ Liq.	1·055–1·085	26	19
„ Tarax. Liq.	1·045–1·060	24	26

Table I.—Tinctures.

Tinctures.	Range of Specific Gravity.	Average Extractive (Gm per. 100 c.c.)	Average Alcoholic Strength per cent. (by Vol.)
Tinctura Aconiti	0·890–0·895	1·4	66
„ Aloes	0·970–0·980	7·5	38
„ Assafetidæ	0·910–0·915	10	66
„ Arnicæ	0·890–0·895	0·6	68
„ Aurantii	0·875–0·887	1·8	74
„ Belladonnæ	0·910–0·916	0·6	59
„ Benzoini Composita	0·890–0·905	17·5	75
„ Buchu	0·925–0·933	4·0	57
„ Calumbæ	0·915–0·920	1·0	57
„ Camphoræ Composita	0·915–0·920	0·3	58
„ Cannabis Indicæ	0·845–0·850	3·5	87
„ Cantharidis	0·835–0·840	0·22	88
„ Capsici	0·890–0·895	1·25	69
„ Cardamomi Composita	0·945–0·950	6	56
„ Cascarillæ	0·895–0·900	2·5	67
„ Catechu	0·975–0·980	15	52
„ Chiratæ	0·920–0·925	1·25	58
„ Chloroformi et Morphinæ. Composita	1·010–1·015	30	52
„ Cimicifugæ	0·923–0·928	2·0	58
„ Cinchonæ	0·915–0·922	6·5	63
„ Cinchonæ Composita	0·915–0·922	4·5	65
„ Cinnamomi	0·900–0·905	2·25	68
„ Cocci	0·950–0·955	2·25	44
„ Colchici Seminum	0·950–0·955	2·0	48
„ Conii	0·895–0·900	1·4	68
„ Croci	0·925–0·930	2·75	57
„ Cubebæ	0·840–0·845	1·5	85
„ Digitalis	0·930–0·935	3·5	55
„ Ergotæ Ammoniata	0·930–0·938	4·25	52
„ Ferri Perchloridi	1·085–1·089	12	22
„ Gelsemii	0·920–0·925	1·25	58
„ Gentianæ Composita	0·965–0·970	5·5	48
„ Guaiaci Ammoniata	0·897–0·905	15	72
„ Hamamelidis	0·948–0·954	2·0	44
„ Hydrastis	0·920–0·925	2·25	58
„ Hyoscyami	0·950–0·957	3·0	45
„ Iodi	0·875–0·880	2·7	86
„ Jaborandi	0·950–0·955	3	48
„ Jalapæ	0·905–0·910	3·5	68
„ Kino	0·995–1·00	22	50
„ Krameriæ	0·935–0·940	5	56
„ Lavandulæ Composita	0·835–0·840	0·5	88
„ Limonis	0·875–0·887	1·8	77
„ Lobeliæ Ætherea	0·815–0·820	1·5	64
„ Lupuli	0·930–0·938	4·0	57
„ Myrrhæ	0·845–0·855	5	85
„ Nucis Vomicæ	0·910–0·915	2·25	65

TABLE I.—TINCTURES, *continued.*

Tinctures.	Range of Specific Gravity.	Average Extractive (Gm. per 100 c.c.)	Average Alcoholic Strength per cent. (by Vol.)
Tinctura Opii	0·950–0·965	3·5	44
„ Opii Ammoniata	0·895–0·900	2·75	63
„ Podophylli	0·845–0·850	3·5	87
„ Pruni Virginianæ	0·935–0·940	3·0	54
„ Pyrethri	0·900–0·905	1·75	68
„ Quassiæ	0·942–0·948	0·5	45
„ Quillaiæ	0·920–0·925	1·25	58
„ Quininæ	0·885–0·895	3·5	74
„ Quininæ Ammoniata	0·925–0·930	1·8	54
„ Rhei Composita	0·967–0·975	16	50
„ Scillæ	0·960–0·970	12	54
„ Senegæ	0·935–0·940	6	56
„ Sennæ Composita	0·985–0·995	11	40
„ Serpentariæ	0·895–0·900	2	68
„ Stramonii	0·954–0·962	3·89	43
„ Strophanthi	0·890–0·893	0·55	69
„ Sumbul	0·900–0·905	2·5	69
„ Tolutana	0·860–0·868	3·5	81
„ Valerianæ Ammoniata	0·940–0·948	3·5	53
„ Zingiberis	0·837–0·843	0·5	89

E. H. Farr and R. Wright (*Pharm. Journ.* [4], **15**, 628), commenting on the above paper, state that with regard to alkaloidal drugs, they are in favour of the fixing of standards, both for crude drugs and their preparations. In order that this may be satisfactorily accomplished it is essential that every monograph for the latter shall be self-contained, and every individual preparation shall be treated as a unit. Their opinions on the subject have been frequently published, and will be found outlined in a note entitled "The Alkaloidal Tinctures of the Pharmacopœia.—Suggestions for Their Standardization," read at the Nottingham Conference in 1893 (*Year-Book*, **1893**, 354); and rather more fully in an article (one of a series) on "Tinctures," published in the *Chemist and Druggist*, **1895**, 559. Quoting from the former, they say:—

The activity of alkaloidal drugs is admittedly due to the contained alkaloids, and the fixing of a definite standard of total alkaloids affords a sufficient guarantee of the activity of the galenical preparations therefrom prepared. The standard itself is a natural one, for the proportion of total alkaloids present in any preparation is undoubtedly a measure of the drug value of that particular preparation, while the gravimetric processes for the

determination of the alkaloids are usually simple and easily worked. This rule applies to such drugs as cinchona, belladonna, calabar bean, colchicum, conium, gelsemium, lobelia, henbane, stramonium, jaborandi, ipecacuanha, veratrum, and others.

The exceptions to the rule are such drugs as aconite, coca, opium, nux vomica, etc.

1. *Standard for Stramonium Seeds.* Schmidt found 0·05–0·37 per cent. alkaloid; Hartz, 0·167 per cent. "Pharmacographia" gives 0·1 per cent. In 11 samples examined by the authors the alkaloidal content ranged from 0·15–0·27 per cent.

On the other hand, Lyons gives 0·45–0·55 per cent., and Parke, Davis, and Co. (*Pharm. Journ., Nov.* 22, **1902**) give 0·3–0·5 per cent. The method by which the latter results were obtained is not stated, but that employed by Lyons (precipitation with Mayer's solution) gives notoriously high results. If a process similar to the official process for the determination of the belladonna alkaloids is followed, it will be found that the authors' figures are approximately accurate, and that the standard proposed by Umney is too high.

2. *Standard for Stramonium Leaves.* "Pharmacographia" gives 0·02–0·03 per cent., while Kordes found 0·2 per cent.

From 3 samples examined by the authors they obtained from 0·12–0·22 per cent. alkaloid, and from a specimen examined in 1893, 0·3 per cent.

Lyons (working by the process of precipitation with Mayer's solution) obtained 0·4–0·5 per cent., and Parke, Davis, and Co. quote 0·27–0·4 per cent. "Pharmacopedia" gives 0·3 per cent. as a fair average.

The authors are of opinion that the proposed standard—viz., 0·4 per cent., will prove too high.

3. *Standard for Nux Vomica Seeds* What is the average alkaloidal content of these seeds? From 5 commercial samples of powdered nux vomica Dunstan and Short obtained from 2·56 to 3·57 per cent. alkaloids, with an average of 3·15 per cent.

In 7 other authentic specimens of seeds the range was from 2·74 to 3·9, with an average of 3·29 per cent. Some seeds from Ceylon yielded from 4·4 to 5·3 per cent.

By the side of these figures those of Umney appear very low.

The authors also consider that the setting up of a double standard is a mistake, involving, as it does, a double difficulty in practical working. There is no evident advantage in fixing a standard of total alkaloids for this drug—a strychnine standard is simpler and better.

It should furthermore be noted that the strychnine standard proposed by Umney is below that required in the present Pharmacopœia. For the production of the official liquid extract of nux vomica it is essential that the seeds used should contain at least 1·5 per cent. strychnine. Umney's proposed standard is from 1 to 1·25 per cent. Its employment for the preparation of the tincture is a decided mistake, and one which should be rectified in the next edition of the Pharmacopœia. The late W. Martindale was a strong opponent of the introduction into the Pharmacopœia of "something to make something else from," and the validity of his objection to the principle could not find a better illustration than in the lamentable results which have attended its application to two of the most important drugs in the Pharmacopœia, viz., belladonna and nux vomica.

4. *Standardization of Conium Preparations.* This drug is included by Umney in the list of those, the chemical constitution and physiological action of which are not sufficiently well known to admit of the standardization of their preparations.

Such, however, is very far from being the case. In 1896 the authors placed in the hands of Dr. Wm. Findlay, of Aberdeen (working under the direction of Professor Cash), an abundance of material, and he made an exhaustive inquiry into the subject of the physiological action of the drug. The first portion of Dr. Findlay's report was communicated to the Glasgow Conference, and is printed in *Year-Book*, **1897**, 358. Briefly, the research proved that the therapeutic effects of a fluid extract of the fruits, standardized to 2·5 per cent. alkaloids, a 2·5 per cent. solution of the total alkaloids, just as isolated from the fruits, and a 2·5 per cent. solution of conine were precisely the same. The physiological action of the other hemlock alkaloids was found to be similar to, but very much weaker than that of conine.

Storax, Liquid, Detection of Resin in. C. Ahrens and P. Hett. (*Zeits. für Angew. Chem.*, through *Pharm. Zeit.*, **48,** 363.) Instead of determining the free acid and saponification number of the drug direct, as recommended by Dieterich, the authors find that better results are obtained by first extracting with light petroleum ether, and titrating the residue from this. Liquid storax, adulterated with resin, gave from 55·1 to 63·7 per cent. of extract, soluble in petroleum ether. This had an acid number of 116·3–120·9 and a (cold) saponification number between 171·6 and 177·6. Pure liquid storax similarly treated

gave from 37·6 to 47·6 per cent. of petroleum ether extract. The acid number of this ranged from 36·6–62·9 and the (cold) saponification number 194·6–198·4.

Sublamin, Mercuric Sulphate Ethylene Diamine, for Disinfecting the Hands. D. Engels. (*Archiv für Hygiene*, through *Pediat.*, **15**, 116.) Although sublamin has relatively only one-tenth the toxic power of corrosive sublimate, it is fully as active as a germicide, besides possessing much more marked penetrative properties. It forms an excellent means of disinfecting the hands, either in a 2 or 3 per cent. aqueous solution, or dissolved in alcohol in the proportion of 2 : 1,000. It produces no irritation, and does not corrode nickel-plated instruments. The author regards it as superior to corrosive sublimate in every respect, and recommends that it should replace the latter for this particular purpose.

Sulphoguaiacine, Preparation of. G. Tarazzi. (*Boll. Chim. Farm.*, **41**, 819, through *Chem. Centr.*, **1903** [1], 188.) Under this name, quinine sulphoguaiacolate has been introduced into therapeutics. Guaiacolsuphonic acid is prepared by the interaction of equal parts of guaiacol and sulphuric acid. This is diluted with 10 volumes of water, and converted into the barium salt by treatment with barium carbonate. After filtration, the barium guaiacol-sulphonate solution is decomposed by an equivalent quantity of quinine sulphate, in solution, and the mixture concentrated. Sulphoguaiacine is then obtained in small yellow bitter scales, which are soluble in water and in alcohol.

Sulphur in Dysentery and Typhoid. (*Merck's Report*, **1902**, 160.) Richmond has reported on the value of sulphur in dysentery, which he prescribes, combined with Dover's powder, thus: Sulphur flowers, washed, 20 grains; Dover's powder, 5 grains. One such powder to be given every 4 hours. J. Woroschilsky finds that sulphur alone has a most favourable influence on typhoid fever. It may be given during any stage of the attack, and does not give rise to any discomfort. All the symptoms are favourably modified. It appears to form a protective layer over the intestinal mucous membrane, while at the same time it undoubtedly exercises antiseptic properties. It is given in doses of 20 grains, hourly, until 150 grains have been taken per day; for children the dose is lessened to 5–8 grains every 2 hours until 60 grains are taken in the day.

Sulphur, Sublimed, the Amount of Free Acid in Commercial Samples. E. Dowzard. (*Chem. and Drugg.*, **61**, 489.) The

amount of free acid in commercial sublimed sulphur varies greatly, as will be seen by the figures below :—

	Free Acid as H_2SO_4 Per cent.		Free Acid as H_2SO_4 Per cent.
No. 1	0·006	No. 11	0·025
No. 2	0·006	No. 12	0·032
No. 3	0·006	No. 13	0·040
No. 4	0·009	No. 14	0·049
No. 5	0·010	No. 15	0·050
No. 6	0·012	No. 16	0·061
No. 7	0·020	No. 17	0·070
No. 8	0·022	No. 18	0·098
No. 9	0·024	No. 19	0·121
No. 10	0·024	No. 20	0·137

The method used in determining these figures was to make 20 Gm. of the sample into a paste with water, dilute to about 150 c.c., and filter; the sulphur on the filter was then washed four or five times with distilled water. The filtrate was titrated with N/10 NaOH solution, using methyl orange as an indicator.

Strychnos rheedii, Constituents of. W. R. Dunstan. (*Imperial Inst. Report*, **1902**, 29, through *Pharm. Journ.*, **15**, 315.) The dried seeds of *Strychnos rheedii*, from Quilon, Travancore, are found to contain no strychnine, and only 0·06 per cent. of brucine.

Tachiol. (*Lancet*, **168**, 1707.) Under this name pure AgFl has been introduced into therapeutics as an antiseptic. It is claimed to be relatively non-toxic, and of far greater bactericidal power than phenol; in aqueous solutious it is but little inferior to $HgCl_2$, while in organic liquids it is superior to the latter salt, since it does not produce insoluble compounds with albumins, and its germicidal properties are not lessened by the presence of NaCl. It is, moreover, free from irritant properties. It possesses, however, the unfortunate property of blackening linen when brought in contact with it. Although the stains thus produced may be readily removed by means of KCN solution, or a solution of $HgCl_2$ 1, NaCl 5, in water 1,000, it is probable that this defect will preclude tachiol from general use as an antiseptic in hospital practice. It has been successfully used by G. Perez for disinfecting cavities, tuberculous and other suppurating lesions. In cystitis, urethritis and other inflammatory affections of the mucous membrane a 1 : 5,000 to a 1 : 1,000 solution may be employed. Where a slight caustic action is called for, the strength of the solution may be increased to 1 : 100.

Theocine. H. Schweitzer. (*Amer. Journ. Pharm.*, **75**, 27, and *Pharm. Zeit.*, **47**, 866.) This is a new synthetic base, identical with theophylline, 1–3 dimethyl-xanthine, isolated by Kossel from tea leaves and found to be isomeric with theobromine. The synthetic commercial product is named theocine to distinguish it from the natural alkaloid theophylline. Theocine forms fine colourless needles, melting at 268°C.; it is soluble in cold water only to the extent of 1:179. It forms compounds with alkalies, ammonium- and potassium-theocine being readily soluble, whereas the sodium compound is only slightly so. It appears to exert but slight action on the heart or circulation, but is a most powerful diuretic, at the same time causing no irritation of the kidneys. According to O. Minkowski (*Merck's Report*, **1902**, 164), doses of 3–6 grains of theocine suffice to cause the excretion of 6 pints to 1 gallon of urine. It is more prompt and powerful in its action than theobromine, but it cannot be considered a perfect substitute for caffeine, since it is devoid of the heart-stimulating properties of that base. Theocine is said to give rise to gastric disturbance and to act as excitant. It should be administered after meals, in warm tea, in doses of 3–6 grains.

Tin, Metallic, as a Tænifuge. Dotchevsky. (*L'Union Pharm.*, **44**, 13.) The author, and also Dommes, state that the ancient reputation of tin as an efficient vermifuge is well founded. Pure precipitated metallic tin, obtained by electrolysis, was employed in the following manner: For 2 days the patient takes saline purgatives and is placed on a sparse diet, composed of readily digestible substances, such as eggs, milk, etc., which do not produce much fecal matter. On the third day 5 cachets, each containing from 8 to 16 grains of pure precipitated tin, are given, 1 to be taken every quarter of an hour. Two hours after the last dose a sharp purgative of castor oil or senna is given. The tænia will generally then be got rid of with the head. This treatment has been employed in 38 cases; in 26 success was immediate: in 7 a second treatment was necessary to obtain the head, and one case required a third treatment. The remainder were lost sight of after one treatment. In no case were any toxic symptoms, or any discomfort observed, except the slight alvine colic caused by the purgatives.

Ulmarene. (*Merck's Report*, **1902**, 166.) Ulmarene is com-

posed of the salicylic esters of aliphatic alcohols of high molecular weight, and, like mesotan, is intended to substitute methyl salicylate. Ulmarene has only a slight odour, resembling that of salol. It is soluble in alcohol, ether, and chloroform, but is insoluble in water. It boils at 237–242°C. and contains 75 per cent. of salicylic acid. Bardet and Chevallier state that it is rapidly absorbed, when applied to the skin in doses of 80 minims, and causes no discomfort. It is identical in action with methyl salicylate, being therefore suitable for use in the treatment of acute articular rheumatism, neuralgias, gout and kindred affections. It may be given internally in doses of 8 minims until 80 minims per diem have been taken. It is best exhibited in gelatin capsules. It is, however, more efficacious when applied directly to the affected parts, which are then covered with an impermeable dressing. It may also be used in the form of an ointment such as the following: Ulmarene, 30; menthol, 3; lanolin, 70. To be applied by gentle rubbing twice daily.

Vegetable Powders and their Diagnostic Characters. H. G. Greenish and E. Collin. (*Pharm. Journ.* [4], **15**, 71, 416, 554, 698; **16**, 276, 703, 843, 871.) Continuing their work on the microscopical characters of powdered drugs, the authors treat of fruits. The papers, consisting of descriptive details of the histological structure of the fruits dealt with, illustrated by woodcuts, do not lend themselves to abstraction, and should be consulted in the original. The series treats of areca nuts, cacao seeds, ignatius beans, black and white mustard seeds, nux vomica, nutmegs, cevadilla seeds, fenugreek seeds, guarana seeds, mace, stavesacre seeds, anise (*Pimpinella anisum*) fruits, caraways, coriander, cummin, fennel, colocynth, cardamoms, cubebs, pimentos, black pepper.

In a subsequent series of papers, powdered woods are dealt with, including guaiacum wood, Jamaica quassia wood, red sanders wood, and yellow sandal wood. Powdered barks are then described, including those of alder buckthorn, cascara sagrada, cascarilla, cassia, cinchona, cinnamon, cusparia, oak, pomegranate root, quillaia.

Veronal. **[Diethylmalonylurea], a New Hypnotic.** (*Apoth. Zeit.*, **23**, 195.) Diethylmalonylurea, $\begin{matrix}C_2H_5\\C_2H_5\end{matrix}\!\!>\!C\!<\!\begin{matrix}CO-NH\\CO-\ N\end{matrix}\!\!>\!CO$, is a slightly bitter, crystalline substance, m.p. 191°C., soluble in boiling water 1 : 12, and in cold water 1 : 145, which, under the name of

veronal, has been recently introduced as a hypnotic. The average dose is 7½ grains; in certain cases 15 grains may be given, and for delicate subjects 5 grains suffice to induce sleep.

Viola tricolor in Acne. (*Merck's Report*, **1902**, 174.) Infusion or decoction of pansy herb has been found to be an active remedy for acne vulgaris. The internal administration of "pansy tea" may occasion an active efflorescence of the eruption, the larger nodules of which should be made to break by the application, over night, of a carbolic or salicylo-mercuric plaster mull. The broken nodules should be dressed with an antiseptic powder or with zinc oxide plaster mull.

Whitethorn Flowers as a Heart Stimulant. Huchard. (*Bull. Comm.*, **31**, 83, after *Journ. des Prakts.*) The tonic properties of the whitethorn, *Cratægus oxycantha*, on the heart have been confirmed. The author finds that an infusion or tincture of the flowers have a distinct action as a heart tonic. The dose of the tincture is 10 drops 3 to 5 times daily; it is quite free from toxic action, and does not act as a diuretic. Although certain, its action is not powerful and immediate, so that the administration should be continued for weeks or even for months. (Compare *Year-Book*, **1901**, 173.)

PHARMACY.

PART III.

PHARMACY.

Acetic Acid, Volatility of, in Dilute Aqueous Solutions. W. Chattaway. (*Analyst*, **28**, 30.) It is found that by simple exposure to the air, in an open vessel, the official dilute acetic acid does not lose strength; on the contrary, it slightly increases in the percentage of acetic acid, the rate of evaporation of the water being greater than that of the acid. Thus in an experiment with dilute acid containing at first 4·27 per cent. of acetic acid, the percentage after 48 hours' exposure was 4·35; in 72 hours, 4·35 per cent.; in 144 hours, 4·35 per cent.; in 168 hours, 4·36 per cent.; in 216 hours, 4·4 per cent.; and finally, in 15 days, 4·69 per cent. *Acetum scillæ*, under like conditions, showed no diminution in the amount of acetic acid; on the contrary, a slight increase in acidity was observed. It is evident, therefore, that deterioration in the acid content of that preparation, cannot be attributed, as has been stated, to volatilization of the acetic acid by exposure.

Alcohol Pencils. T. G. Unna. (*L'Union Pharm.*, **43**, 454.) The *stili spirituosi* used by Unna in the treatment of certain skin affections are composed of: Sodium stearate, 6; glycerin, 2·5; alcohol, q.s. to produce 100. The pencils are stored in small tin tubes. Other active ingredients may be prescribed with this alcoholic soap basis.

Adrenaline, Some Dispensing Difficulties with. D. Black. (*Pharm. Journ.* [4], **16**, 484.) The following prescriptions, containing adrenaline, were brought under the notice of the Glasgow and West of Scotland Pharmaceutical Association, with the appended notes as to dispensing the same: No. 1. Cocain. hydrochlorid., gr. ix.; solutio. adrenalin., ʒiss.; iodin., gr. iv.; aq. laurocerasi, ʒii.; glycerin., to ℥i. This formula is absolutely incompatible, as iodide of cocaine is precipitated. The formula might be serviceable with the omission of the cocaine hydrochloride. A difficulty would be the dissolving of the iodine; the author failed

to obtain complete solution of the iodine in the glycerin inside 48 hours. With 6 gr. of potassium iodide solution was effected in a few minutes.

No. 2. Sol. adrenalin. chlor., ʒii.; plumbi acet., gr. x.; otto rosæ, ♏iv.; solut. boroglycerid. in aq. ros. 5 per cent., ad ℥viii.; fiat collyrium et cola per chart. This formula, at first, makes a perfectly bright and clear solution, but, after standing a few hours, a reddish flocculent precipitate is formed, due to some reaction between the adrenalin and lead acetate.

No. 3. ℞. Pulv. ac. boracic., ʒi.; sol. adrenalin., ʒi.; lanolin., ad ℥i. This can easily be made by rubbing up the boric acid with the lanoline on a slab and then working in the adrenalin solution, but it takes a little time. An easier and probably better way is to use just enough heat to melt the lanoline, incorporate adrenalin, and rub up with the acid.

No. 4. ℞. Cocain. hydrochlor., gr. x.; sol. adrenalin. chlor., ʒi.; aq., ad ♏200. To be used as an application. Here the cocaine easily dissolves in 100 minims water, the solution adrenalin is added, and the 200 minims is made up with additional water. A perfectly clear solution results.

No. 5. ℞. Homatropin. hydrobrom., gr. i.; cocain. hydrochlor., gr. ii.; chloreton., gr. ½; sol. adrenal. chlor., ʒii. The only difficulty here is the solubility of the chloretone, it being very insoluble in water—about 1 in 400. By rubbing to a fine powder and then triturating in a glass mortar for a time with the adrenalin solution; a clear solution is effected in a shorter space of time by heating the chloretone with the adrenalin solution in a test-tube, but this is not advisable, as a camphoraceous odour is given off, probably due to the decomposition of the chloretone.

No. 6. ℞. Protargol. gr. x.; sol. adrenalin., ʒss.; aq. dest., ad ℥i. The protargol is triturated in a glass mortar, with water, 6 drachms, till dissolved, the adrenalin added, and finally the solution made up to the necessary volume.

No. 7. ℞. Sol. adrenalin. chlor., ʒiii.; chloreton., gr. vi.; sol. boroglycerid. in aq. rosæ duplic. 5 per cent., ad ℥viii. By trituration with the boroglyceride solution the chloretone dissolves with no further trouble.

Ammonium Acetate Solution. J. P. Gilmour. (*Pharm. Journ.* [4], **16**, 95.) Cochineal solution is recommended as the indicator to obviate the difficulty of determining the neutral point with litmus, in the presence of excess of CO_2 in the preparation of ammonium acetate solution.

Antiseptic Soap, Liquid. P. Antoine. (*L'Union Pharm.*, **44,** 51.) Caustic potash (70 per cent.), 50; oil of sweet almonds, 200; glycerin, 100; distilled water, q.s. to produce 1,000. Dissolve the caustic potash in twice its weight of water. Add the oil and the glycerin, and agitate well. Add the remainder of the water and keep the mixture on the water-bath at 60–70°C. for 24–36 hours, when saponification will be complete. A clear mixture will then be obtained, covered by a layer of emulsified, non-saponified oil. This unsaponified oil is syphoned off; the transparent jelly of soft soap remaining is then treated with alcohol 90 per cent, 70; oil of lemon, 10; oil of bergamot, 10; oil of verbena, 10. The mixture is heated to 60°C. for several hours, then set aside in a cool place for several days. The soap thus obtained, although transparent when hot, becomes slightly turbid on cooling, and shows small, pearly, suspended crystals of potassium stearate. It is strained through cotton wool, when a bright, amber-coloured liquid, sp. gr. 1·020, will be obtained. This is an excellent material for disinfecting the hands before performing surgical operations. It contains a trace of free alkali, which is unimportant. If thought desirable, this may be neutralized by a current of CO_2, or with a little alcoholic solution of tartaric acid. If an antiseptic be required to be added, 1 part of β-naphthol may be dissolved in the mixture of alcohol and essential oils. Oil of sweet almonds gives, as indicated, the best results. Poppy seed oil furnishes a soap which is too liquid and insufficiently unctuous in consistence. The potash employed for saponification should be free from carbonate.

Antiseptic Ointment, Reclus's. (*Journ. Pharm. Chim.* [6], **17,** 407.) Iodoform powder, 1; salol, 2; powdered boric acid, 5; powdered antipyrine, 5; vaseline, 40. Mix. Useful as a general antiseptic dressing for wounds, especially where pus is present or complete antisepsis is doubtful. It is at the same time antiseptic, analgesic, and deodorant.

Antiseptic Paste for Moist Surfaces. Socin. (*Répertoire* [3], **14,** 349.) Difficulty is often experienced in applying an antiseptic dressing to moist surfaces, such as the lips, after operation for hare-lip. This may be obviated by the use of the following paste: Zinc oxide, 50; zinc chloride, 5; distilled water, 50. The paste is applied to the wound, previously dried, by means of a brush or a spatula, allowed to dry on, and left *in situ* for 5 or 6 days. It may then be removed and a fresh application made.

Aspirin, Incompatibility of, with Sodium Bicarbonate. E. Rousseau. (*L'Union Pharm.*, **43**, 456.) When aspirin is mixed with sodium bicarbonate, the powder in a few days becomes converted into a semifluid black mass, liberating acetic acid. The author, having to compound a mixture of aspirin, exalgine and sodium carbonate, prescribed to be given in cachets, found the mixture to decompose as stated, and traced the cause to the action of the sodium bicarbonate on the acetyl salicylic ester. Consequently, these two substances should not be prescribed as a mixture.

Australian Pharmaceutical Formulary (*A.P.F.*, **1902**.) The united pharmaceutical societies of Australia have adopted, under the above title, the Unofficial Formulary of the Victorian Pharmaceutical Association. The formulæ remain as given in *Year-Book*, **1901**, 187, with the exception of one or two small and negligable alterations, and the addition of *Liquor Ferri Iodidi*. The latter is thus prepared :—

Liquor Ferri Iodidi. (For Syrup of Iodide of Iron.) 1 part to 7 parts of simple syrup. R. Ferri, ½ oz. ; iodi, 726 grs. ; acid. hypophosph., 1½ fld. drs. ; aquæ, q.s.

Digest the iron wire (free from oxide) and iodine in a glass flask, loosely stoppered with cotton wool, with 2 fl. ozs. of distilled water, keep gently boiling with continual shaking, controlling the action by means of a cold-water bath until the liquid loses its yellow colour. Heat to boiling ; allow to cool, filter, add the hypophosphorous acid and pass sufficient recently-boiled and cooled water through the filter to make 2½ fl. ozs. Spg. 1·63.

Preserve in small full bottles, the corks of which have been soaked in melted hard paraffin.

Dip cork and neck of bottle in melted paraffin and store away from direct light.

Can be made in 20 minutes.

It is suggested that when prescribing these unofficial substances, medical men should append the letters *A.P.F.* after the name. By so doing, the use of a preparation of uniform and constant composition and strength will be ensured.

Balsam of Tolu, Syrup of, Some Reactions of. A. Astruc and J. Cambe. (*Journ. Pharm. Chim.* [6], **17**, 367.) The official (Codex and B.P.) syrup of balsam of Tolu, prepared by digesting the balsam in water, may be distinguished from syrups obtained by the admixture of a tincture of the balsam, or of a distillate

therefrom, with syrup, by the fact that it alone will liberate iodine from a solution of KI in sufficient quantity to impart a yellow tint to the mixture, and to give a blue colour-reaction with starch. Both the substitutes named, which are frequently met with in Continental pharmacy, are without action on KI. With alkalies, too, the behaviour is different. The official syrup, and that prepared with the tincture, give a greenish yellow colour with alkaline solutions, which is discharged on the addition of acid. The syrup made with the distillate fails to give any colour reaction with an alkali.

Basic Lead Acetate, Modified Method of Preparing. J. P. Gilmour and H. Rodwell. (*Pharm. Journ.* [4], **16**, 96.) The fact stated by Squire, that leaving the ingredients in contact in the cold for a week produces a better product than the official method of boiling, is confirmed. A recently prepared sample had a specific gravity of 1·2845, as compared with the sp. gr. of the B.P., 1·275, and contained 27·8 Gm. $PbO.Pb(C_2H_3O_2)_2$ in 100 Gms. The estimation was performed by precipitating the lead as oxalate, decomposing this with dilute H_2SO_4, and determining the free oxalic acid by means of N/10 solution of $K_2Mn_2O_8$.

Beeswax as an Excipient for Drugs intended for Intestinal Medication. Maurel. (*Bull. gén. de Therapeut.*, **145**, 221.) Attention is directed to the value of yellow beeswax as an excipient for those drugs which are required to pass through the stomach unaltered, and to exercise their action only in the intestines. The method, which is due to Mondière, consists in simply incorporating the active ingredient with sufficient melted yellow wax to give the mass the consistence of a confection when warm. This is then divided into boluses, containing the prescribed dose of the drug, either by the pharmacist, or by the patient. The author has employed the method for many years, invariably with good results. As a typical prescription he instances the following: Yellow wax, 10; copaiba balsam, 20; powdered cubebs, q.s. to give when warm, the consistence of a confection. The wax and copaiba are mixed while warm, and the requisite quantity of cubebs is worked in. Ipecacuanha, senega, senna, and other powdered drugs may be prescribed in a similar manner. No unpleasant eructations and no gastric disturbance have been found to follow the administration of any of these in the manner described, even when relatively large doses are given. The process is stated to

be efficacious, and, compared with the method of coating with keratin and other acid-insoluble agents, very simple.

Catgut, Surgical, Sterilization of with Chloroform Vapour. M. Guerbet. (*Journ. Pharm. Chim.* [6], **16**, 595.) The vapour of $CHCl_3$ at a temperature of 140°C. is found to be an efficient means of rendering catgut absolutely sterile, without making it brittle or lessening its breaking strain. The catgut, freed from fat and moisture, is introduced into a perfectly dry glass tube, which is then drawn out at one end. Two c.c. of $CHCl_3$ is then introduced by means of a small, narrow pipette which reaches to the bottom of the glass tube, so that wetting the sides with the liquid is avoided. The chloroform is then cooled with a jet of methyl chloride and the constricted portion of the tube is sealed. Entrance of moist air into the tube after adding the chloroform, during the cooling process, is prevented by attaching to the portion, above the constriction, a perforated cork fitted to a small $CaCl_2$ drying tube. After sealing, the tube is placed in an autoclave and heated to 140°C. for 30 minutes, then allowed to cool slowly. Catgut thus sterilized rapidly regains its pliable properties, after being plunged for a few seconds in sterilized aqueous solutions. (See also *Year-Book*, **1902**, 221.)

Blaud's Pills, the Origin of. John Humphrey. (*Pharm. Journ.* [4], **16**, 643.) The author traces the history of the formulæ for Blaud's pills from that first published by Cottereau in 1831, and the authentic formula of Blaud in 1832, to the present day.

Borax, Incompatibility of, with Chloral Hydrate. H. Meurin. (*L'Union Pharm.*, **44**, 56.) Having to dispense a gargle in which chloral hydrate and borax were prescribed together in an aqueous menstruum, decomposition of the former was found to occur, chloroform being liberated. In the cold, this reaction takes place slowly, but in warm solutions it is much more rapid. It may be obviated by the addition of a little glycerin. Manseau, commenting on the above (*Répert. de Pharm.* [3], **15**, 215) points out that the addition of glycerin is unnecessary if sufficient boric acid to convert the borax into sodium biborate be added. To effect this, a weight of the acid equal to that of the borax prescribed is added. Both with glycerin and boric acid, however, the prevention of decomposition is only effected for cold solutions; on warming, $CHCl_3$ is evolved. If a few drops of lactic acid be added

to the mixture, however, it may be heated without decomposing. A small crystal of tartaric or of citric acid is equally effective.

Calcium Lactophosphate, Syrup of. Harold Deane. (*Pharm. Journn.* [4], **16**, 127.) It is found that the precipitate formed on the addition of phosphoric acid to the solution of calcium lactate in the official formula, consists of calcium lactate and not phosphate. By the following method the formation of this precipitate is avoided. The process gives a good syrup, and is suggested as an amendment to the official procedure: Precipitated calcium carbonate, 25 Gm.; concentrated phosphoric acid, 50 c.c.; lactic acid, 60 c.c.; refined sugar, 700 Gm.; orange flower water of commerce (undiluted), 25 c.c.; distilled water, a sufficient quantity. Add the precipitated calcium carbonate gradually to the concentrated phosphoric acid and the lactic acid, mixed, and diluted with 250 c.c. of distilled water. When solution is complete, add the undiluted orange flower water, filter and wash the filter with 100 c.c. of distilled water. Dissolve the refined sugar in the mixture without the aid of heat; add sufficient distilled water to make 1,000 c.c. of the syrup.

A sample made according to this formula has been kept in an ordinary well-lighted room for 6 months without showing appreciable change.

Calcium Lactophosphate, Syrup of. J. P. Gilmour. (*Pharm. Journ.* [4], **16**, 96.) It is an improvement to rub down the precipitated chalk with half the quantity of water ordered for the dilution of the lactic acid. Add this milk to the diluted acid in the receiver of a percolator, or other similar wide-mouthed vessel, shaking after each addition, until a clear solution is obtained. If the official directions are observed the calcium lactate with a core of undecomposed carbonate floats in lumps on the surface of the dilute acid, and takes much longer to dissolve.

Camphor Liniment, Modified Process for the Preparation of. J. P. Gilmour. (*Pharm. Journ.* [4], **16**, 95.) Heat three-fourths of the oil to 100°C. Place the camphor in a mortar, and triturate into a fine paste with a portion of the cold oil, thin with the rest, and transfer to a warmed bottle. Wash out the mortar with a little of the hot oil, and then pour this and the rest of the hot oil into the bottle and shake. The camphor will all dissolve in 1 or 2 minutes. The same process may be conducted in the cold, when solution will take some days; or the camphor, after being rubbed with cold oil, may be placed with the rest of the oil in

a lightly closed vessel and heated to 71°C. The advantage of trituration is that it ensures uniform fine division, and so provides a larger surface for the solvent to act upon. (Compare *Year-Book*, **1902**, 497).

Carbolic Gauze, Preparation of. L. Yvon. (*Journ. Pharm. Chim.* [6], **16**, 584.) The author finds that, however modified, no process will ensure the preparation of a gauze that will contain approximately 10 per cent. of phenol. The best results were obtained from the following method, which, at the lowest, will give a product containing not less than 7 per cent. Crystalline carbolic acid, 115 is dissolved in alcohol, 90 per cent., 1,500; to the solution, glycerin 35 is added. Gauze, suitably cut and folded, 1,000, is placed in an enamelled vessel fitted with a perforated false bottom, having a tap beneath and covered with the liquid. The vessel is covered and set aside until saturation is complete. The liquid is then drawn off by the tap, and the gauze squeezed until its weight is 2,650. It is then rolled up and immediately enveloped, while still wet, in parchment paper, and stored in a cardboard box, or, preferably, in a tin. This should be kept in a cool place.

Cascara, Liquid Extract of. J. P. Gilmour. (*Pharm. Journ.* [4], **16**, 94.) If cascara bark be moistened with the B.P. proportion of water and allowed to macerate for 12 hours, the marc is exhausted with from three-fourths to four-fifths the menstruum otherwise required. Maceration for longer periods, such as 18 and 24 hours, effects no further saving, and is indeed a disadvantage, since the bark swells much more, and percolation is additionally difficult. The same observation applies to the use of an increased quantity of menstruum for moistening the bark. A capital arrangement for automatically maintaining the stratum of menstruum above the marc consists of a douche-can with tube and tap. The latter can be adjusted so that the water from the can comes in drops. The risk of overflow is obviated by using a cork with two holes, one for the douche-can tube, and one for a long glass tube that rises to the high level of the water in the reservoir.

Chilblain Ointment, Lassar. (*Practitioner*, **69**, 511.) Lassar finds that none of the usual remedies appear to be of much good but the following ointment to give good results: Lead ointment and vaseline, of each 1 ounce; olive oil, half an ounce; carbolic acid, 24 grains; lavender oil, 25 minims. To be applied freely at night on lint or linen.

Cinchona, Liquid Extract of. Warin. (*Journ. Pharm. Chim.* [6], **16**, 424.) Having compared the various methods for the preparation of liquid extract of cinchona, the following is recommended as giving a product which has a high alkaloidal and extractive value, and which mixes bright with water: 200 Gm. of powdered cinchona bark is moistened with a mixture of water, 80 Gm., and HCl, 10 Gm., and left in contact for 2 hours at 60°C. The whole is then transferred to a percolator, and more water added until percolation commences. The lower orifice is then closed, maceration allowed to continue for 24 hours, when percolation is resumed with water until the bark is exhausted. The first 170 c.c. collected is reserved, and second percolate is evaporated to 10 c.c., then added to the reserve and, finally, alcohol 95 per cent. 20 Gm. is added, making the final weight 200 Gm. From a bark containing 5·84 per cent. of total alkaloids the above process gave a fluid extract of the sp. gr. 1·058, which yielded 4·03 per cent. of alkaloids and 24·32 per cent. of residue. This process is similar to that of the Dutch Pharmacopœia, except that it contains no glycerin. The presence of glycerin is considered to serve no useful purpose, since the author's method gives a product richer in true extractive, and, at the same time, it seriously interferes with the process of standardization of the alkaloids. Fluid extracts of the official U.S.P. type are objected to since they precipitate with water, and contain less extractive than those prepared with an aqueous menstruum.

[In the concluding paragraph the author states that in his process *the whole of the liquid, without any reserved portion* resulting from the percolation, is subjected to evaporation, as in the official process of the Dutch Pharmacopœia. But in the text, this process (No. 3) is stated to be similar to a previous experiment (No. 1), in which 170 *parts is reserved*, as stated above. These two statements, therefore, appear inconsistent.—Ed. *Year-Book.*]

Cinchona Wine. L. Yvon. (*Répertoire* [3], **15**, 11.) The following process is suggested for the preparation of a wine of cinchona, which will contain the maximum quantity of alkaloids. Succirubra bark, powdered, 50, is moistened with a mixture of alcohol (60 per cent.), 100, and hydrochloric acid (10 per cent.), 10, and allowed to macerate for 6 days. Bordeaux wine, 1,000, is then added, allowed to stand 24 hours, and filtered. In fact, the author finds that the first maceration may be completed in 24 hours, since no material increase in the alkaloidal strength of the preparation

follows more prolonged maceration. It is, therefore, possible to prepare by this method an active cinchona wine in 2 days. The wine obtained is deeper in colour than that resulting from the official (Codex) method, and remains clearer. It does not seem to lose its bouquet.

Coca, Liquid Extract of; and Liquid Extract of Cinchona. J. P. Gilmour and J. Lothian. (*Pharm. Journ.* [4], **16**, 94.) The B.P. process is almost impracticable owing to the excess of menstruum with which the drug is macerated in each case. 20 ounces of powdered cinchona bark and 5 pints of distilled water plus hydrochloric acid and glycerin, are to be macerated for 48 hours, and 20 oz. coca leaves in powder are to be macerated in 40 oz. of 60 per cent. alcohol for a similar period. Percolation is tedious and ineffective in both cases. The U.S.P. process is recommended, in which a much smaller quantity of menstruum is used for macerating purposes.

Cocaine Hydrochloride, Incompatability of with Borax. Manseau. (*Bull. Soc. de Bordeaux*, through *Répert. de Pharm.* [3], **15**, 213.) Bache has recommended the addition of a pinch of boric acid to a solution of borax and cocaine hydrochloride, to redissolve the precipitate formed. The author, however, finds that this is not always sufficient; as, for instance, when 1 Gm. of cocaine hydrochloride and 2 Gm. of borax are present in 100 c.c. of water. If, however, sufficient boric acid to convert the borax into sodium biborate be added, the alkaloid is kept in solution. It is found that 100 c.c. of a 5 per cent. solution of sodium biborate will dissolve 1 Gm. of cocaine hydrochloride. In practice, it is sufficient to use a weight of boric acid equal to the borax prescribed, dissolve in water, and add the cocaine hydrochloride. Obviously the addition of the acid is not requisite where glycerin is prescribed with the borax, as is frequently the case with gargles.

Cocaine Hydrochloride, Incompatibility of with White Precipitate. M. Jean. (*L'Union Pharm.*, **43**, 307.) Having to dispense a prescription in which cocaine hydrochloride was prescribed with white precipitate, in a vaseline basis, the author found that on adding the mercurial compound to the aqueous solution of the salt, immediate decomposition of the former took place, with the formation of a black magma, in which the anesthetic properties of the cocaine were markedly diminished. This may be avoided by the following procedure: The cocaine hydrochloride is dissolved in a drop of water. The white precipitate

is rubbed down with a little oil of sweet almonds, and mixed with the cocaine solution. The prescribed amount of vaseline is then added.

Cod-liver Oil, Casein Emulsion of. (*Nat. Drugg.*, **33**, 102.) The *Giornale di Farmacia* recommends the use of sodium caseinate as an emulsifying agent in preparing emulsions of cod-liver oil, as it is not only as effective but much cheaper than the casein saccharate now almost exclusively used for that purpose (in Italy). It is prepared as follows: Precipitate the casein of 1 litre of fresh milk in the usual manner and dissolve it in a 5 per cent. solution of sodium carbonate in cherry-laurel water, to which is added 50 Gm. distilled water. The resulting transparent solution, about 200 c.c. in volume, is put into a flask of 2,000 c.c. capacity, and 500 Gm. cod-liver oil added. Simple syrup, 250 Gm. and distilled water sufficient to make it up to 1,000 c.c. is poured in, and the whole emulsified by agitation. The cherry laurel water may be dispensed with in the solution of casein, by using distilled water with a little creosote added.

Cod-liver Oil Emulsion. Tonneau. (*L'Union Pharm.*, **43**, 504.) Lime water, 430, is shaken, in a bottle, with cod-liver oil, 500; when emulsified, glycerin, 50, and tincture of cinnamon, 20 parts, are added. The emulsion is expeditiously prepared with the use of a mortar, is stable, and is stated not to leave an unpleasant fishy taste on the palate.

Cod-liver Oil Emulsion with Irish Moss. R. A. Robinson, Jun. (*Pharm. Journ.* [4], **16**, 96.) It is not very generally known how quickly such an emulsion of cod-liver oil and Irish moss mucilage may be prepared with suitable apparatus. By the pestle-and-mortar method cod-liver oil emulsion is not more quickly made with mucilage of Irish moss than with acacia, but if equal quantities (say 6 fl. ozs) of cod-liver oil and of a 2 per cent. decoction of the moss (the moss being boiled with the water for half an hour and then made up to its original bulk and strained) be placed together in a 1 lb. jam-pot or other suitable vessel, and whipped with a stirrer making 1,200 revolutions a minute, a thick white emulsion is formed in a few seconds. This speed can very readily be attained by the use of an ordinary egg-whisk, in which are two circular rotating beaters, attached by cranks to a handle turned by the operator. Many such egg-whisks are geared up, so that for each complete turn of the handle the beaters complete five revolutions, and no difficulty will be found in turning the

handle four times in a second; the speed mentioned is thus arrived at. An emulsion, slightly sweetened, containing 25 per cent. of oil, and flavoured with almonds, lemon, or wintergreen oil, is a very stable and satisfactory article. The addition of about 20 per cent. of glycerin or half a grain of benzoic acid per fluid ounce of emulsion will be necessary if the product is to be kept bottled for any time. The method above described will not answer with mucilage of acacia.

Cod-liver Oil, Nutritive, Rectal Injection of. Zeuner. (*Pharm. Centr.*, **44**, 152, after *Therap. Monats.*) Pancreatin, 5 Gm.; inspissated ox gall, 0·5 Gm.; salt 1·5 Gm., are dissolved in water, 50 Gm., and digested for 2 hours with frequent agitation with cod-liver oil, 250 Gm. To the emulsion thus obtained, eucalyptus oil, 3 drops, is added. The mixture is warmed to body heat, and well agitated immediately before use. From 60 to 100 Gm. may be given at a time.

Cod-liver Oil, Phosphorized. E. Bourquelot. (*Journ. Pharm. Chim.* [6], **16**, 163.) The absence of any official formula for phosphorized cod-liver oil having been the cause of serious accidents in France, the following formula has been proposed for inclusion in the Codex: Phosphorized oil, 1 per cent., 5; cod-liver oil, 995. Mix carefully. 20 Gm. of this oil contains 1 Mgm. of phosphorus. To be prepared as required.

Cod-liver Oil, Some Pharmaceutical Preparations of. (*Schweiz. Woch. für Chem. und Pharm.*, **40**, 400.) *Gay's Cod-liver Oil Emulsion.* Cod-liver oil, 500; sugar, 190; gum acacia, 5; gum tragacanth, 5; infusion of coffee, 200; rum, 100. Mix the sugar and the gums. Shake up the oil with the coffee. Add a portion of this liquid to the powders in a mortar and rub together until an emulsion is formed; then add the rum, and lastly, the rest of the oily mixture. Emulsify by trituration.

American Emulsion of Cod-liver Oil. Cod-liver oil, 800 Gm.; decoction of Irish moss (1 : 20), 500 Gm.; syrup of tolu, 250 Gm.; essence of curaçao, 2 Gm.; oil of lemon, 1 Gm.; oil of coriander, 5 drops; oil of star anise, 2 drops; water to produce 1,600 Gm. Add the oil gradually while emulsifying to the decoction of Irish moss; then the syrup, and lastly, the flavouring ingredients, previously dissolved in a little alcohol.

Durst's Emulsion of Cod-liver Oil and Hypophosphites. Cod-liver oil, 250 Gm.; gum tragacanth, 1 Gm.; saccharin, 0·2

Gm.; sodium bicarbonate, 0·1 Gm.; yolks of two eggs; simple tincture of benzoin, 3·5 Gm.; chloroform, 2 Gm.; oil of bitter almonds, 10 drops; alcohol, 10 Gm.; sodium hypophosphite, 10 Gm.; calcium hypophosphite, 10 Gm.; water sufficient to produce 500 Gm. Dissolve the saccharin in about 150 Gm. of the water, by means of the sodium bicarbonate. Rub down a little of the oil with the gum, the yolk of egg and a little water, gradually add the other liquids, oil and water alternately, thoroughly emulsifying after each addition. Finally add the hypophosphites previously dissolved in a little water, and make up to 500 Gm. with more of that liquid.

Chocolate Emulsion of Cod-liver Oil. Decoction of Irish moss (1 : 20), 150; cod-liver oil, 250; glycerin, 60; cacao powder, 30; essence of vanilla, 0·50. Rub the cacao powder with the decoction, warm the mixture, add the oil and glycerin and emulsify with egg yolk.

Kreytschy's Cod-liver Oil. Cod-liver oil, 500; freshly ground coffee, 20; animal charcoal, 20. Heat together to 60°C. in a flask for 15 minutes. Allow to stand for several days, then filter.

Duquesnel's Cod-liver Oil. Cod-liver oil, 150; oil of eucalyptus, 2. Mix.

Dieterich's Iodised Cod-liver Oil. Cod-liver oil, 100; iodine, 1; chloroform, 2. Rub down the iodine with a little of the oil. Add the chloroform, then the rest of the oil, and shake until a clear mixture results.

Toellner's Iodised Cod-liver Oil. Tincture of iodine (1 : 10), 10; cod-liver oil, 1,000. Mix.

Reboul's Concentrated Iodised Cod-liver Oil. Rub down iodine, 5, with cod-liver oil, 250; introduce into a flask, and heat on the water-bath until the iodine has combined, as shown by the non-production of a blue colour when a little of the oily liquid is treated with starch solution. This concentrated iodised oil is used as a basis for making the prescribed dilutions.

Ferrated Cod-liver Oil. Solution of ferric chloride is precipitated with an excess of solution of sodium benzoate. The precipitate is collected, washed, drained, and 20 parts of this is mixed with sufficient sodium benzoate to form a dry powder. This is rubbed down with 100 parts by weight of cod-liver oil, and heated on the water-bath at a temperature not exceeding 32°C. The ferric benzoate is thus dissolved, while the sodium salt remains insoluble, and is filtered out. The oily solution, contain-

ing about 2 per cent. of iron, is diluted with 4–9 parts of oil for medicinal use.

Dieterich's Ferrated Cod-liver Oil. Solid dialyzed iron, 37·5 Gm., is dissolved in distilled water, 200 c.c. White hard soap, 3·5 Gm., is also dissolved, by the aid of heat, separately in a similar quantity of water. The solutions are cooled and mixed; the precipitated ferric oleate is collected, washed, and drained until the weight is 20 Gm. It is then placed in a capsule with sodium chloride, 5 Gm., and cod-liver oil, 100 Gm., and heated on the water-bath, with constant stirring, until the iron oleate is dissolved. The product is then filtered. It contains about 2 per cent. of iron, and is diluted with cod-liver oil before use.

Iodised Cod-liver Oil and Iron. (1) Iron filings, 2; iodine, 4; cod-liver oil, 40, are mixed in a mortar, a little ether being added, and triturated together until a blackish mixture results. This is then made up to 1,000 Gm. with more oil, and filtered. It contains about 0·5 per cent. of ferrous iodide. (2) Iodine, 1·7; iron filings, 1; cod-liver oil, 1,000. Introduce into a flask and leave in contact for 8 days, with occasional agitation. Filter and add cod-liver oil, 900. The product contains about 0·2 per cent. of ferrous iodide.

Sweetened Cod-liver Oil. Cod-liver oil, 100 Gm.; saccharin, 0·4 Gm.; acetic ether, 2 Gm.; peppermint oil, 5 drops.

Eucalyptus Emulsion of Cod-liver Oil. Cod-liver oil, 240 Gm.; sodium carbonate, 0·6 Gm.; oil of eucalyptus, 0·75 Gm.; syrup, q.s. to produce 450 Gm. Emulsify.

Peptone Emulsion of Cod-liver Oil. Cod-liver oil, 240 Gm.; peptone, 160 Gm.; sugar, 60 Gm.; oil of wintergreen, 25 drops; alcohol 90 per cent., 30 Gm.; water sufficient to make 480 Gm. Emulsify.

Emulsion of Cod-liver Oil with Calcium Hypoposphite. Cod-liver oil, 150; hypophosphite of calcium, 3; glycerin, 25; water, 75; mucilage of acacia, 145. Emulsify.

Quillaia Emulsion of Cod-Liver Oil. Cod-liver oil, 200; glycerin, 30; tincture of quillaia, 6; cherry laurel water, 4. Emulsify

Licorice Emulsion of Cod-liver Oil. Cod-liver oil, 60 glycerin, 30; glycyrrhizin, 3·5; water to make 120. Emulsify.

Dextrin Emulsion of Cod-liver Oil and Hypophosphites. Cod-liver oil, 20 Gm.; distilled water, 60 Gm.; glycerin, 10 Gm.; gum acacia, 20 Gm.; dextrin, 10 Gm.; calcium hypophosphite, 1 Gm.; sodium hypophosphite, 0·5 Gm.; oil of bitter almonds, ½ drop; oil of lemon, 1 drop.

Flavoured Cod-liver Oil. Cod-liver oil, 100; cherry laurel water, 15. Shake together and then separate and reject the watery layer.

Cod-liver Oil and Pancreatin. Cod-liver oil, 150; water, 50; extract of malt, 200; soluble scale pancreatin, 1; sodium chloride, 2; sodium bicarbonate, 2. Dissolve the salts and the pancreatin in the water. Mix the oil and the extract, then gradually add the solution.

Colchicine Pills. (*Merck's Report*, **1902**, 46.) Colchicine, one of the most valuable remedies for gout, is best prescribed in the form of pills. Colchicine, 1 grain, is massed with extract of licorice, 144 grains, and licorice powder, q.s. The mass is divided into 120 pills. Two to four pills, taken at intervals in 48 hours, are sufficient to cut short an attack of gout.

Colloidal Silver, Preparation and Pharmacy of. Brocadet. (*L'Union Pharm.*, **44,** 1.) Danlos and Cothereau give the following process for preparing colloidal silver: Citric acid, 300 Gm., is dissolved in water, 2,000 c.c., and neutralized with ammonia. Ammonio-ferrous sulphate, 558 Gm., is dissolved separately in 2,000 c.c. of cold water. The two solutions are mixed, and then silver nitrate, 60 Gm., dissolved in distilled water. 600 c.c., is poured in gradually, in small quantities at a time, with constant stirring. After allowing the mixture to stand, protected from air and light, the supernatant liquid is decanted, the precipitate collected, washed, and finally dried between 40 and 50°C. It forms a black powder, the particles of which have a metallic lustre. It is soluble in 25 parts of water.

Colloidal Silver Ointment. Colloidal silver, 3; lanoline, 7 benzoated lard, 10. Triturate the silver first with a little water then mix with the fats.

Solution for Intravenous Injection. Colloidal silver, 1; sterilized distilled water, 100. Moisten the silver with a little water until the particles are softened, then dissolve in the prescribed quantity of water by agitation.

For Internal Administration colloidal silver is usually prescribed in the form of pills or in solution, in doses of 1–2 grains in 24 hours.

Solution of Colloidal Silver. Colloidal silver, 1; fresh white of egg, 3; glycerin, 3; water, 300 parts by weight. A teaspoonful to be taken three or four times a day, in milk, half an hour before meals.

Pills. Colloidal silver, 1; milk sugar, 5; distilled water, 5; glycerin, q.s. Mass and divide into 100 pills. Four to six to be taken daily.

Pessaries. Colloidal silver, 4¾ grs.; distilled water, 1 drop; cacao butter, q.s. to make 10 pessaries.

Solution for Veterinary Use. Colloidal silver, 1; distilled water, 100. Administered as an injection into the jugular vein of horses or cattle in doses of 25–50 c.c.

Donovan's Solution, Composition of. W. Duncan. (*Pharm. Journ.* [4], **16**, 586.) Various opinions as to the nature of the soluble constituents of Donovan's solution have been expressed. The older authorities regarded it as double salt; others held that the solution merely contains the two iodides uncombined. The author finds that neither of these hypotheses are correct, and that the arsenium is present chiefly as As_2O_3 with a little undecomposed arsenium iodide, hydriodic acid and mercuric iodide. Most of the HI is combined with the HgI_2, forming the soluble compound H_2HgI_4. As free iodine is liberated on standing or exposure to light, this reacts on the As_2O_3 with the formation of As_2O_5. It was found that in a eight year old sample almost the whole of the arsenic had been oxidized into arsenic acid. It is suggested that sufficient alkali should be added to neutralize the HI formed, and thus increase the stability of the solution; also that the official directions for the preparation of the liquor should be amended, so that trituration should be continued until all the ingredients have dissolved, not "nearly all," as at present, since this relatively insoluble matter is arsenious oxide. If a portion of this be left undissolved, the solution will not be of full or definite strength.

Ether, Anesthetic, Purification and Preservation of. R. Stollé. (*Berichte Pharm.*, **12**, 28.) Treatment with metallic sodium, as in preparing anhydrous ether, is sufficient to remove all objectionable impurities from ether intended for anesthetic purposes. Each litre of ether should be treated with 10 Gm. of metallic sodium in minute pieces, the flask containing it being fitted with a $CaCl_2$ tube, which will allow the exit of any gas formed, and prevent the absorption of water. After standing thus for three days, the ether is filtered off. To keep it, a few particles of bright sodium should be added to the filtered ether.

Ergot, Ammoniated Tincture of, New Method of Preparation. W.

Lyon. (*Pharm. Journ.* [4], **15**,437.) The following method is suggested as giving more thorough exhaustion of the drug than the official process. The quantity of ergot to be employed is not stated since it is for the authorities to decide of what strength the preparation should be. For every litre of tincture required, take the requisite quantity of the drug in No. 20 powder and rub it in a mortar with 100 c.c. of solution of ammonia. When properly mixed, pack the marc in a percolator, set aside for 24 hours, and then percolate with 750 c.c. of alcohol 70 per cent., added in portions. When all the alcohol has been added, continue the percolation with distilled water until 750 c.c. of tincture have been collected. Now empty the receiver and continue percolation with distilled water until the ergot is exhausted. Evaporate the percolate to 250 c.c., mix with the alcoholic portion, set aside for 24 hours, filter, if necessary, and adjust to one litre by the addition of alcohol 70 per cent.

Dusting Powder for Infantile Eczema. (*Rev. Med. Pharm.*, **9**, 66.) Starch, French chalk, lycopodium, of each, 40; bismuth subnitrate, 2; salicylic acid, 2; menthol, 1. Apply freely to the affected parts.

Extractum Filicis Liquidum, Method of Dispensing. H. Carter. (*Pharm. Journ.* [4], **15**, 369.) For every drachm of extract use 10 minims of tincture of senega, the *modus operandi* being to measure the tincture, add water up to a volume equal to that of the extract, then pour the latter into the mixture of tincture and water. Next transfer to a bottle and shake well; then make up with water, or other menstruum, to the required quantity.

Formulæ Selected from British Naval Hospital Formularies. (*Chem. and Drugg.*, **62**, 626.) *Mist. Acid. Tonic.* Acid. nit. hyd. dil., ♏xj.; tr. gent. co., ʒj.; syr. aurant., ʒij.; aq. ad, ℥j. M.

Mist. Alkalina. Pot. nit., gr. v.; pot. bicarb., gr. xx.; tr. aurant., ♏x.; aq. ad, ℥j. M.

Mist. Bismuth. Rub. Liq. bismuth. B.P., ♏xl.; spt. chloroform, ♏x.; tr. nucis vom., ♏iiss.; acid. hydrocyan. dil., ♏1½; tr. coc. cact., q.s.; liq. morph. hyd., ♏vj.; aq. ad, ℥j. M.

Mist. Diarrhœæ. Tr. opii, ♏x.; tr. zingib., ♏x.; tr. catechu, ♏xx.; tr. cinnam., ♏xx.; mist. cret. ad, ℥j. M.

Mist. Diuretic. Pot. acet., gr. xx.; acet. scillæ, ♏xx.; spt. æth. nit., ♏xx.; dec. scopar. ad, ℥j. M.

Mist. Pectoral. Vin. ipecac., ♏v.; vin. antimon., ♏v.; liq.

morph. hyd., ♏v.; oxymel., ♏v.; syr. scillæ, ♏xx.; tr. card. co., ♏xx.; aq. ad, ℥j. M.

Mist. Rhei Ammon. P. rhei, gr. iv.; ammon. carb., gr. ij.; inf. quass., ℥ss.; aq. menth. pip., ℥ss. M.

Mist. Sodæ et Gent. Sod. bicarb., gr. x.; tr. card. co., ♏xx.; inf. gent. ad, ℥j. M.

Mist. Sodæ et Rhei. Sod. bicarb., gr. x.; P. rhei, gr. x.; spt. ammon. arom., ♏xx.; aq. ad, ℥j. M.

Mist. Senegæ ("*Stokes'*"). Ammon. carb., gr. iv.; spt. æth., ♏xj.; tr. camph. co., ♏xxij.; tr. scillæ, ♏xv.; syr. simp., ʒss.; decoct. seneg. ad, ℥j. M.

Mist. Senegæ (*Ordinary*). Ammon. carb., gr. v.; spt. chlorof., ♏x.; syr. simp., ʒss.; decoct. seneg. ad, ℥j. M.

Mist. Moschi. ("*Nil Desperandum.*") Spt. amm. arom., ʒiss.; spt. æth. nit., ʒj.; spt. æth., ʒiss.; tr. moschi, ʒj.; tr. lavand. co., ʒiij.; syr. aurant., ℥ss.; aq. camph. ad, ℥viij. M.

Mist. Ol. Terebinth. Ol. terebinth, ♏xv.; tr. card. co., ʒj. vitel. ov., q.s.; muc. acac., ʒj.; aq. menth. pip. ad, ℥j.; M.

Linct. Chlorodyni. Tr. opii, ʒj.; chlorodyn. B.P. 1885, ʒij.; acid. sulph. dil., ʒij.; oxy. scillæ, ℥j.; theriac., ℥iij. M.

Dose: One teaspoonful.

Linct. Tolu. Liq. morph. acet., ♏xxiv.; oxy. scillæ, ʒiij.; syr. tolu., ʒv.

Dose: One teaspoonful.

Injections. Injections are largely used, the following especially:—

Inject. Cupri Sulph. Co. Alum., gr. x.; ferri sulph., gr. x.; cupri. sulph., gr. x.; zinci sulph., gr. x.; aq. ad, ℥xx. S. et M.

Inject. Eucalypt. Ol. eucalypt., ʒiss.; mucil. acac., ʒij.; aq. ad, ℥viij. M.

Inject. Iodoform. Co. Iodoform., ʒiij.; bismuth. subnit., ʒiij.; zinci sulph., ʒj.; plumb. acet., ʒj.; glycerin., ℥j.; aq. ad, ℥xx. M.

Inject. Plumb. Co. Liq. plumbi subacet., ♏xvj.; zinci acet., gr. xx.; morph. acet., gr. j.; tr. catechu, ♏xxiv.; aq. ad, ℥viij. M.

Two favourite lotions are: *Lotio Acid. Carbolic.* Acid. carbolic, ʒv.; acid. acetic. dil., ʒvij.; camphor, gr. xl.; spt. vin. rect., ℥iiss.; aq. ad, ℥xl. M. and

Lotio Calamin. Calamin., ʒss.; zinci ox., gr. 20; acid. boric., gr. j.; glycerin, ℥ss.; aq. ad, ℥j. M.

Ung. Bals. Peruv. Bals. peruv., ʒij.; ceræ alb., ʒij.; adipis, ℥ij.; ol. rosmarin., gtt. xx. M.s.a.

Ung. Sulph. c. Hyd. Sulph. sublim., gr. xxx.; hyd. ammon., gr. v.; creosot., ♏iv.; ol. olivæ, ʒij.; adipis, ℥j. M.s.a.

Ung. Boric Co. Acid. boric., ℥j.; cer. alb., ℥j.; ol. amygd. dulc., ℥ij.; vaselini, ℥ij. M.s.a.

Formulæ Selected from St. Thomas's Hospital Pharmacopœia, 1902. *Emulsio Chloroformi.* Chloroform, 1 fl. oz., tincture of quillaia, 3 fl. drs., or tincture of senega, 1 fl. dr.; water, to 1 pint. Mix, with strong agitation.

Note. This preparation, containing the chloroform emulsified by the quillaia, has the same strength as the official spirit of chloroform, which it may replace as a flavouring and preservative addition to "mixtures," etc. Most "mixtures" containing vegetable extracts, infusions, or tinctures are liable to become mouldy, if kept under ordinary conditions longer than about seven days. Such "mixtures" may be preserved by the addition of 10–15 ♏ of chloroform emulsion per fl. oz. If chloroform disagrees, or is otherwise objectionable, ¼–½ grain of benzoic or salicylic acid per fluid ounce is usually effectual in preserving "mixtures."

Linimentum Atropinæ. Atropine sulphate, 38½ grs.; compound tincture of lavender, 100 ♏; alcohol 90 per cent., to 1 pint.

Note. This liniment does not stain the skin or clothes of the patient, and has the same alkaloidal strength (0·375 w/v per cent.) as the official belladonna liniment.

Glycerinum Atropinæ. Atropine sulphate, 25½ grs.; water, 5 fl. ozs. Dissolve and add compound tincture of lavender 100 ♏; glycerin, to 1 pint.

Note. This preparation does not stain the skin or clothes of the patient. It contains 0·25 parts of atropine per 100 fluid parts, and has nearly the same strength as the glycerin of belladonna, formerly in use.

Mistura Asafetidæ Composita. Asafetida, picked, 5 grs.; liquid extract of cascara sagrada, 10 ♏; ammonium carbonate, 4 grs.; infusion of valerian (1 in 40), to 1 fl. oz.

Triturate the asafetida to a smooth emulsion with the infusion, and decant from coarse particles.

Note. The ammonia in this mixture develops the taste and odour of the other constituents.

Mistura Cascaræ Sagradæ. Liquid extract of cascara sagrada,

30 mms.; liquid extract of licorice, 30 ♏; aromatic spirit of ammonia, 20 ♏; chloroform water, to 1 fl. oz.

Note. The ammonia prevents the formation of an unsightly deposit in this mixture. It loses its bitter flavour after standing several weeks.

Mistura Cascaræ Sagradæ Composita. Liquid extract of cascara sagrada, 20 ♏; liquid extract of licorice, 30 ♏; tincture of belladonna, 5 ♏; tincture of nux vomica, 5 ♏; aromatic spirit of ammonia, 20 ♏; chloroform water, to 1 fl. oz.

Note. The addition of nux vomica and belladonna increases the purgative action of the cascara. The mixture loses its bitter flavour after standing several weeks.

Mistura Olei Morrhuæ. Cod-liver oil, 4 fl. drs.; mucilage of gum acacia, 1 fl. dr.; syrup of tolu, 20 ♏; gluside, $\frac{1}{16}$ gr.; water, to 1 fl. oz.

Emulsify the oil by trituration with the mucilage, adding a little water from time to time as the product becomes thick. In place of the mucilage, 30 grs. of powdered gum acacia may be used, a fresh mucilage being made by first triturating the gum with 45 mms. of water.

Note. This emulsion contains half its volume of oil, with the least possible quantity of gum; the taste of the oil is effectually disguised. Acids, alcohol, and crystalline salts, if prescribed with this mixture, except in small proportions, cause the oil to separate.

Mistura Ferri Aromatica. Solution of ferric chloride, 10 mms.; aromatic spirit of ammonia, 20 ♏; syrup, 40 ♏; water, to 1 fl. oz.

Mix the syrup with the iron solution, and add the aromatic spirit, previously diluted with the water.

Note. The sugar contained in the syrup, by this method of mixing, prevents the precipitation of the red ferric hydroxide, which would otherwise occur on mixing an alkaline liquid with the solution of a ferric salt. The resulting mixture is nearly neutral, and almost free from styptic taste.

Mistura Jalapæ cum Rheo. Jalap resin, $\frac{1}{4}$ gr.; compound tincture of rhubarb, 10 ♏; tragacanth, $\frac{1}{4}$ gr.; syrup of ginger, 5 ♏; glycerin, 10 ♏; caraway water, to 1 fl. oz.

Powder the resin, mix with the tragacanth, add the tincture, and then the other ingredients in the order given. Dose, 1 fl. dr. for a child one year old.

Note. The official extract of jalap varies considerably in

strength; hence the resin of jalap is used, with tragacanth to suspend it.

Solutio Salina. Normal Saline Solution. Sodium chloride, 60 grs.; water, to 1 pint.

Dissolve. This solution contains salt nearly equivalent to 0·7 per cent., and has about the same osmotic equivalent as blood-serum. It is usually sterilized by boiling at least 5 minutes in a flask, the neck of which is plugged with sterilized cotton wool.

Solutio Saponis Ætherea. Ether-Soap. Oleic acid, 7 fl. ozs.; alcohol 90 per cent., 3 fl. ozs.

Mix, and neutralize with a saturated solution of potassium hydroxide in water (1 in 1), of which nearly 1½ fl. oz. will be required, using phenol-phthalein as indicator. Allow the neutralized product to cool, and add oil of lavender, 20 mms.; methylated ether, sp. gr. 0·770, to 1 pint. Preserve in well closed bottles.

Note. The detergent action of this solution may be increased by using a slight excess of potash solution. Ether-soap solution is used to cleanse skin-areas before surgical operations. A small quantity should be well rubbed in until the surface is dry, then, with a brush and hot water thoroughly scrub the skin. The ether, being a fat-solvent, penetrates the epidermis and carries the soap with it.

Tabellæ Santonini Compositæ. Santonin, 1 gr.; calomel, 1 gr.; chocolate powder, 2 grs.

Lightly compressed. They should be disintegrated in the mouth, or crushed and given as powder.

Gauze, Iodoform, and Salol. Leclair. (*Journ. Pharm. d'Anvers*, **58**, 407.) *Iodoform Gauze* 30 *per cent.* Iodoform in finest powder, 30; glycerin, 30; solution of mercuric chloride, (1 : 1,000), q.s.; gauze, free from dressing, 100. Mix the iodoform and the glycerin, add to it sufficient mercuric chloride solution, so that the gauze when introduced is just completely saturated. The gauze is evenly moistened with the mixture (it need not be unrolled entirely for the purpose), and, when saturated, allowed to drain, and partially dried in a dark place. It is rolled while still somewhat damp, and wrapped in parchment paper. Gauze thus prepared contains practically the quantity of iodoform prescribed, and is cheaper than that prepared with alcohol and ether.

Salol Gauze is prepared in a similar manner, the salol being first dried, powdered, and sifted through a fine silk sieve.

Gelatin Basis for Suppositories, Pessaries and Bougies. Vossius. (*Journ. Pharm. Chim.* [6], **17**, 408, after *Journ. Pharm. d'Anvers.*) *Suppository Basis.* Gelatin, 15; distilled water, 10; glycerin (sp. gr. 1·260), 75.

Pessary Basis. Gelatin, 15; distilled water, 15; glycerin (sp. gr. 1·260), 170.

Bougie Basis. Gelatin, 20; distilled water, 10; glycerin (sp. gr. 1·260), 70.

Dissolve the gelatin with a gentle heat on the water-bath, in the mixed glycerin and water. Filter with expression through lint. Replace the filtered liquid on the water-bath and incorporate the prescribed medication; then mould as required.

Gelatinization of Tincture of Kino. E. White. (*Pharm. Journ.* [4], **16**, 644.) The gelatinization of tincture of kino is shown to be due to the presence of an enzyme, which may be destroyed by subjecting the freshly made tincture to the heat of a water-bath for an hour. A portion of some tincture, made from an authentic sample of Indian kino, was thus treated, and showed no signs of gelatinization after keeping 2 years, while the bulk of the batch, which was unheated, gradually increased in viscosity until it finally set to a firm jelly, although the unheated portion was stored in a stoppered bottle, and the heated portion was kept in a not very efficiently corked bottle. A portion of this heated tincture was now placed in a dish covered over with a beaker, so as to exclude dust but allow free access of air; after several weeks' exposure no increase of viscosity was observable. A fresh sample of tincture from the same parcel of kino was then prepared and exposed to the air side by side and under the same conditions as the heated sample; after a few days it commenced to thicken, and in about 10 days was gelatinous and almost free from astringent taste. The heated sample meanwhile remained fluid and showed no diminution in astringency.

Gentian, Compound Tincture of. P. Boa. (*Pharm. Journ.* [4] **16**, 587.) On the grounds that the present formula for compound tincture of gentian gives a preparation which is so bitter as to be nauseous, it is suggested that the official directions should be modified. 1 ounce of gentian root to one pint of menstruum should be employed, and maceration should be conducted for 24 hours only.

Guaiacum, Ammoniated Tincture of. W. Lyon. (*Pharm. Journ.* [4], **15**, 437.) Attention is called to the fact that of

the five ammoniacal tinctures now official, three are made with an alcoholic menstruum containing approximately 10 per cent. of solution of ammonia, one (opium) contains 20 per cent., and guaiacum the equivalent of 22·5 per cent. It is suggested that this also should be made with an alcoholic menstruum containing 10 per cent. solution of ammonia. The large excess of alkali is shown to have no beneficial action on the solubility of the resin, which is easily soluble in alcohol alone; the amount of dissolved extractive obtained with the official menstruum is so slightly greater than that given to the solution weaker in ammonia, that it may be disregarded.

Hermophenyl, Pharmacy of. (*L'Union Pharm.*, **43,** 408.) Hermophenyl, mercury-sodium disulphocarbolate, may be given by hypodermic injection in daily doses of $\frac{1}{3}$–$\frac{2}{3}$ gr.; or, by the mouth, from $\frac{1}{2}$–$1\frac{1}{4}$ grs. It may be compounded as follows:—

Syrup. Hermophenyl, 10 grs., dissolved in water, 2 drs.; then add syrup of orange, 14 fl. ozs.; Malaga wine, sufficient to produce 18 fl. ozs. Dose, 2–4 tablespoonfuls per diem.

Pills. Hermophenyl, $\frac{1}{3}$ gr.; extract of cinchona, 1 gr.; powdered licorice root, q.s. For 1 pill.

Dusting Powder. Hermophenyl, 1; any inert sterile powder, 19. Bismuth salts, boric acid, charcoal, and other powders may be added, as prescribed.

Dilute Solution. Hermophenyl, 1 or 2; boiled water, 200. To substitute $\frac{1}{2}$ or 1 per cent. sublimate solution.

Strong Solution. Hermophenyl, 2–3; recently boiled water, 100. For disinfecting the hands and the site of operation.

Solution for General Dressings. Hermophenyl, 1; recently boiled water, 1,000. To replace sublimate solution, 1 : 250; or boric acid solution, 4 : 100, for general antisepsis.

Vaseline. Hermophenyl, 1; vaseline, 30.

Ointment. Hermophenyl, 1; water, 4; lanoline, 5, vaseline, 20.

Collyrium. Hermophenyl, 1; recently boiled water, 30. For the eyes of new-born infants.

Urethral Injection. Hermophenyl, 1; recently boiled water, 250. (See also *Year-Book*, **1901,** 152.)

Hetol Caffeine (Caffeino-Sodium Cinnamate). G. Griggi. (*Boll. Pharm. Chim.*, through *Pharm. Zeit.*, **47,** 900.) This compound of caffeine and cinnamic acid is stated to possess the full diuretic action of caffeine-sodium salicylate, and caffeine sodium

benzoate, without exerting any depressant action on the heart. It is prepared by dissolving caffeine, 10·6 Gm., sodium cinnamate, 8·5 Gm., in warm water, 40 c.c., filtering the solution while hot, and evaporating the filtrate to dryness, at a temperature not exceeding 60–70°C. The product is an amorphous, odourless, bitter powder, with an alkaline reaction to litmus. It is soluble in 2 parts of water and in 50 parts of alcohol. It may be distinguished from the above-mentioned salts by the following reactions: Its 1 : 20 aqueous solution gives with Fe_2Cl_6 at first, a dark brown colour, later, a precipitate, which is soluble in alcoholic hydrochloric acid. With uranium nitrate in slight excess it affords a clear green precipitate.

Hydrogen Peroxide, Pharmacy of. N. Novikov. (*L'Union Pharm.*, **43**, 409.) *Mixture.* Hydrogen peroxide, 6; water, 85; simple syrup, 15. Given in dessertspoonful doses, for adults, in infectious diarrhœa, pulmonary gangrene, and as a general digestive disinfectant. For infants, the same mixture is prescribed, but the dose is only a teaspoonful every two hours, in infantile cholera, diphtheria, and similar infectious diseases.

Gargle. For adults and children old enough to use a gargle, half an ounce of hydrogen peroxide in a tumblerful of water may be prescribed.

Application. Pure undiluted hydrogen peroxide, 10 volumes, may be applied directly to the throat in diphtheria and other affections of that part.

Ointment. Hydrogen peroxide, 2 or 3; anhydrous woolfat, 200. Useful in eczema and other parasitic skin diseases. In all the above formulæ hydrogen peroxide, 10 volumes, should be dispensed.

Ichthyol, Some Pharmaceutical Formulæ of. (*Merck's Report*, **1902**, 94.) *Mixtures.* Renzi prescribes ichthyol internally as follows: Ichthyol, 1; simple syrup, 2; peppermint water, 8. A small teaspoonful to be taken in a tumblerful of water. This should be repeated twice for the first day, and gradually increased until the patient is taking 160–170 minims of ichthyol per diem. For children the following may be prescribed: Ichthyol, 2; glycerin, 8; syrup of orange, 8; distilled water, 60. A small teaspoonful three times a day after meals.

Ointments. Ichthyol is being largely used in ophthalmic surgery. Blepharitis and eczematous affections of the eye-lid yield to treatment with the following ointment of R. Ferro-ichthyol, 1; copper sulphate, 1; vaseline, 50. Fedorow employs the following

for application to the eye: Ichthyol, 2; cocaine hydrochloride, 3; simple ointment, 100.

"*Ichthyol salicyl*," a powder which has attracted some attention, is stated to be a mixture of ammonium ichthyol with 25, 33·5, or 50 per cent. of sodium salicylate.

International Conference for Unification of the Formulæ of Potent Medicines. F. B. Power. (*Amer. Journn. Pharm.*, **75**, 1.) As the result of the meetings held at Brussels in September, 1902, the following recommendations were formulated:—

ARTICLE I.

It is proposed that the medicaments here enumerated should receive the following Latin designations, and that they should be prepared in accordance with the directions placed opposite their names:—

Name of Medicament.	*Directions for Preparation.*
Aconitum napellus, *L.*	
Aconiti tuber seu Tuber Aconiti.	Only the tuber of the current year to be employed, in a dry state. In preparing the powder no residue should be left.
Aconiti tinctura seu Tinctura Aconiti.	To be prepared by percolation with alcohol 70 per cent. by volume. This tincture to be standardized to 0·025 per cent. of total alkaloids by a method to be hereafter determined.
Atropa belladonna, *L.*	
Belladonnæ folium seu Folium Belladonnæ.	Only the dry leaf to be employed. In preparing the powder no residue should be left.
Belladonnæ tinctura seu Tinctura Belladonnæ.	To be prepared of 10 per cent. strength by percolation with 70 per cent. alcohol.
Belladonnæ extractum seu Extractum Belladonnæ.	A solid extract, containing about 10 per cent. of water, to be prepared by means of 70 per cent. alcohol. The alkaloidal strength will be subsequently defined.
Colchicum autumnale, *L.*	
Colchici semen seu Semen Colchici.	The seed only, not the corm, to be employed.

Name of Medicament.	*Directions for Preparation.*
Colchici tinctura seu Tinctura Colchici.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Digitalis purpurea, *L.*	
Digitalis folium seu Folium Digitalis.	The leaf of the second year's growth to be employed. In preparing the powder no residue should be left.
Digitalis tinctura seu Tinctura Digitalis.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Uragoga Ipecacuanha, *Baill.*	
Ipecacuanhæ radix seu Radix Ipecacuanhæ.	The powder to be prepared from the bark of the root, and the ligneous portion rejected. The powder should contain 2 per cent. of alkaloids.
Ipecacuanhæ tinctura seu Tinctura Ipecacuanhæ.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Ipecacuanhæ sirupus seu Sirupus Ipecacuanhæ.	Prepare with 10 per cent. of the tincture.
Hyoscyamus niger, *L.*	
Hyoscyami folium seu Folium Hyoscyami.	The leaf only to be employed.
Hyoscyami tinctura seu Tinctura Hyoscyami.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Hyoscyami extractum seu Extractum Hyoscyami.	A solid extract, containing about 10 per cent. of water, to be prepared by means of 70 per cent. alcohol.
Strychnos nux vomica, *L.*	
Strychni semen seu Semen Strychni seu Nux vomica.	Should contain 2·5 per cent. of alkaloids.
Strychni tinctura seu Tinctura Strychni; Nucis vomicæ tinctura seu Tinctura Nucis vomicæ.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol. Alkaloidal strength 0·25 per cent.
Strychni extractum seu Extractum Strychni; Nucis vomicæ extractum seu Extractum Nucis vomicæ.	To be prepared by means of 70 per cent. alcohol. Alkaloidal strength 16 per cent.

Name of Medicament.	*Directions for Preparation.*
Opii pulvis seu Pulvis Opii.	The powder to be dried at 60°C., and to contain 10 per cent. of morphine.
Opii extractum seu Extractum Opii.	Should contain 20 per cent. of morphine.
Opii tinctura seu Tinctura Opii.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol. Should contain 1 per cent. of morphine.
Opii tinctura crocata seu Tinctura Opii crocata seu Laudanum Sydenhami.	Should contain 1 per cent. of morphine.
Opii et Ipecacuanhæ pulvis compositus seu Pulvis Doveri.	Should contain 10 per cent. of Pulvis Opii.
Opii tinctura benzoica seu Tinctura Opii benzoica.	Strength in morphine 0·05 per cent.
Strophanthi tinctura seu Tinctura Strophanthi.	To be made of 10 per cent. strength by percolation with 70 per cent alcohol; the seed not to be deprived of fat.
Sclerotium clavicepitis purpuræ *Tul.* seu Clavicepitis purpuræ *Tul.* sclerotium.	
Secale cornutum seu Ergotum secale.	Ergot not more than 1 year old, and to be kept in its entire state.
Secalis cornuti extractum seu Extractum Secalis cornuti; Ergoti extractum seu Extractum Ergoti.	Prepare an aqueous extract, and take up the latter with 60 per cent. alcohol.
Secalis cornuti extractum fluidum seu Extractum fluidum Secalis cornuti; Ergoti extractum fluidum seu Extractum fluidum Ergoti.	Of 100 per cent. strength.
Acidum hydrocyanicum dilutum.	Of 2 per cent. strength.

Name of Medicament.	*Directions for Preparation.*
Laurocerasi aqua seu Aqua Laurocerasi.	To contain 0·10 per cent. HCN.
Amygdalæ amaræ aqua seu Aqua Amygdalæ amaræ.	To contain 0·10 per cent. HCN.
Phenoli solutio seu Aqua phenolata.	Of 2 per cent. strength.
Arsenas sodii seu Sodii arsenas; Arsenicicum natrium seu Natrium arsenicicum.	The crystallized salt, containing 36·85 per cent. of arsenic acid.
Arsenicalis Liquor Fowleri seu Liquor arsenicalis Fowleri seu Kalii arsenicosi liquor.	To contain 1 per cent. of arsenious acid.
Ferri iodidi sirupus seu Sirupus iodeti ferrosi seu Sirupus ferri iodati.	To contain 5 per cent. of anhydrous ferrous iodide.
Cantharidis tinctura seu Tinctura Cantharidis.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Iodi tinctura seu Tinctura Iodi.	Of 10 per cent. strength, prepared with 95 per cent. alcohol.
Lobeliæ tinctura seu Tinctura Lobeliæ.	To be made of 10 per cent. strength by percolation with 70 per cent. alcohol.
Cocainum hydrochloricum.	The anhydrous salt.
Hydrargyri unguentum seu Unguentum Hydrargyri.	Of 30 per cent. strength.
Antimoniale vinum seu Vinum antimoniale; Stibiatum vinum seu Vinum stibiatum.	To contain 0·40 per cent. of tartar emetic.

ARTICLE II.

In future the following principles should be observed:—

(*a*) A potent medicament should not be prepared in the form of a medicinal wine.

(*b*) Tinctures of potent drugs should be made of 10 per cent. strength, and by percolation.

(c) Fluid extracts of potent drugs should be of 100 per cent. strength.

ARTICLE III.

It would be expedient to adopt a normal drop counter, of which the external diameter of the dropping tube should be exactly 3 Mm. In other words, at a temperature of 15°C., and with distilled water, 20 drops should be equivalent to 1 Gm.

Iodine Soaps. H. Skinner. (*Brit. Journ. of Derm.*, **15**, 126.) The following formulæ, used at the Great Northern Central Hospital for the local application of iodine, are stated to have supplanted alcoholic solutions of iodine. The preparations possess the advantage of not staining, or, when strong, only producing a mark which may be removed with soap and water :—

(*a*) R. Iodi resublimat. ½ oz.; acid. oleic. ½ fl. oz.; alcohol. 3 fl. drs.; liq. ammon. fort., 1 fl. dr. This makes a soapy paste, soluble in all liquids except fixed oils.

(*b*) R. Iodi resublimat. 1 oz.; acid. oleic. 2 fl. ozs.; liq. ammon. fort., 3 fl. drs.; ol. paraffin alb., to 1 pint. This form is stated to have almost ousted alcoholic solutions of iodine at the hospital. A still better result for external use may be obtained by dissolving 1 oz. of iodine in 5 ozs. alcohol, with 1 oz. of solution of ammonium oleate (made from oleic acid and "alcoholic ammonia"), the product being made up to the pint by the addition of glycerin. Solution of the potassium oleate, used instead of soft soap as a vehicle for tar, formalin, and similar medicaments, is not suitable for iodine preparations, as combination takes place too rapidly, and the compound becomes colourless.

Iodine, Solubility of, in Glycerin. Catillon. (*Bull. Comm.*, **31**, 86, after *Répertoire.*) By first dissolving iodine in acetone or alcohol, mixing this solution with glycerin and evaporating the solvent at a low temperature, solutions of iodine in glycerin 1 : 3 and even 1 : 2 may be obtained. The statement of the Codex that the solubility of iodine in glycerin is 1 : 52 is incorrect. On account of the viscosity of the fluid the immersion method of dissolving the solid is useless. Direct solution may be obtained by heating the iodine and glycerin in a closed vessel to between 120 and 150°C.

[Under these last conditions the product would probably not be a true solution ; chemical combination to a considerable extent would probably take place.—ED. *Year-Book.*]

Iodine, Tincture, Preservation of. A. Claret. (*Norw. Rem.*, **19**, 150.) The pain and subsequent desquamation which follows

the local application of the Codex tincture of iodine (1 : 12 with 90 per cent. alcohol) is attributed to presence of hydriodic acid, which forms on keeping. To obviate this, the author proposes the addition of borax to the formula, thus: Iodine, 1; alcohol, 90 per cent., 12; borax, 2. This neutralizes the acid as it is formed, and does not interfere with the therapeutic activity of the iodine.

Iodoform, to Remove the Odour of. (*Rev. Med. Pharm.*, **9**, 626.) To remove the odour of iodoform from the fingers after handling iodoform dressings, it is merely necessary to pour a few drachms of orange flower water over the hands, and to thoroughly rub with the liquid those parts which have come in contact with the iodoform. It is stated that the disagreeable odour will thus be entirely removed.

Iron Acetate Solution, Preservation of. W. Lyon. (*Pharm. Journ.* [4], **15**, 437.) The addition of 10 per cent. of glycerin, or more, to the official liquor is suggested as a preservative. It is stated that as at present prepared, the solution is far from stable.

Keratin Coating for Pills. Yvon. (*Bull. Soc. Pharm. de Lyon*, **40**, 439.) In order to ensure that pills, intended to act only in the alkaline secretion of the intestines, should not be disintegrated in the acid gastric juice, they should be coated with keratin in the manner directed below. Pills containing salts of metals, alum, creosote, acids, or tannin, should be coated with an acetic acid keratin solution. Those containing alkalies, soap, bile, metallic sulphides, or digestive ferments, should be treated with an ammoniacal keratin solution. For certain neutral bodies, such as naphthalin, either the acid or alkaline solution may be employed. The acid solution of keratin is made by digesting keratin, 7, in acid acetic (50 per cent.), 100 for 24 hours in a gentle heat, then straining through glass wool. The alkaline keratin solution is obtained by dissolving with gentle heat, and frequent agitation, keratin, 7; in solution of ammonia (10 per cent.), 50; alcohol (90 per cent.), 50, finally straining through cotton wool. To avoid any faults in the coating, the pills must be perfectly dry, and not be massed with any vegetable powder which will swell in the presence of moisture. The best excipient is one composed of beeswax, 1; cacao butter, 9; and sufficient inert powder, such as kaolin, charcoal, or French chalk. After rolling, they should first be coated with cacao butter, then burnished by rolling in a little powdered graphite. They are then to be fixed

on needles, and dipped in the suitable keratin solution. Generally ten such immersions will be necessary to ensure perfect coating. The coating is sufficient when a pill containing one grain of calcium sulphide, coated as a test, gives rise to no sulphurous eructation one hour after it has been swallowed. The following varnish answers all the purposes of keratin, and is much less troublesome to apply: Salol, 4; tannin, 1; ether, 20. Coat the pills evenly with this, and dry.

Lead Subacetate Solution and its Valuation. T. S. Barrie. (*Pharm. Journ.* [4], **15**, 276.) It is evident that, assuming a solution of basic lead acetate has medicinal virtues not possessed to the same extent by a solution of the neutral acetate, there should be a standard test limiting the amount of this salt, just as there is a minimum limit for amount of the dissolved calcium oxide in lime water.

Such a test is to be had in determining the alkalinity of the solution by normal or decinormal sulphuric acid, either by direct titration in presence of litmus or indirectly by using excess of acid, and determining the free acid by standard alkali, using phenol-phthalein as indicator.

In order to discover how far a freshly prepared *liquor plumbi subacetatis fortis* responded to the official requirements, and the suggested improvement, 10 fl. ozs. of the official solution were prepared, and the following factors obtained:—

1. Sp. gr., 1·263.
2. (A) Average of two determinations of the dissolved lead, as sulphate, and calculated as sulphate, 28·31 per cent.
   (B) Calculation of the lead sulphate into amount of decinormal sulphuric acid for 1 Gm. official liquor, 18·7 c.c.
3. (A) 1 c.c. required for neutralization 8·8 c.c. of decinormal sulphuric acid.
4. (B) Calculation of A into Gm. and c.c., 1 Gm. solution required 6·96 c.c. of decinormal acid.

One deduction to be made from the foregoing figures is that the dissolved compound in the official solution does not consist entirely of the salt—$Pb(C_2H_3O_2)_2PbO$—for in that case the acid for neutralization would have been 9·35 c.c. instead of 6·96 for 1 Gm., but instead consists of basic with unchanged acetate. An official test for alkalinity would, therefore, have to be based on practical working instead of being based on theoretical considerations alone. It would be both interesting and useful if manufacturers and others would publish figures showing the

alkalinity of the preparations they have made or met with. A minimum limit would then easily be fixed by the authorities.

The sp. gr., given officially as 1·275, seems to call for revision, for it has been shown above that a solution having a sp. gr. of 1·263 is able to pass the volumetric test of the Pharmacopœia.

Libanol, Pharmacy of. Boisse. (*Schimmel's Report, Oct.,* **1902,** 26.) The essential oil of the Atlas cedar has been introduced under the name of "libanol." The oil itself is given in capsules, each containing 3½ grs. Libanol may be employed to mask the odour of cod-liver oil, being used in the proportion of 4–5 parts to 100 of the oil. It is stated to render oil flavoured with it more digestible.

Ointment for Burns and Scalds. Libanol, 1 ; vaseline, 4.

Mixtures. (*a*) Libanol, 2–3 ; emulsion of almonds, 150. (*b*) libanol, 2–3 ; syrup of orange flowers, 30 ; milk, 120.

Inhalation. Libanol ; formalin ; equal parts.

Injection for Urethritis. Libanol, 1 ; sterilized vaseline oil, 4.

Embrocation for Rheumatism. Libanol, 30 ; oil of eucalyptus globulus, 20 ; turpentine oil, 20 ; alcohol 90 per cent., 30.

Gargle. Libanol, 1 ; vaseline oil, 9.

Ointment for Skin Diseases. Libanol, 4 ; vaseline, 30.

Magnesium Carbonate Solution. J. P. Gilmour. (*Pharm. Journ.* [4], **16,** 95.) Although not new, the expedient of making fluid magnesia in a gazogene is simple and satisfactory, but the question arises as to whether it complies with the B.P. process as to pressure. This point is easily settled. An approximately accurate manometer may be made with a piece of glass tubing, closed at one end and divided into a half, third, and fourth, the divisions being indicated by string collars. This is connected with the nozzle of the gazogene and the valve opened. The height to which the liquid rises in the tube gives the pressure. At the end of 24 hours it is generally found to be about 3½ atmospheres. For a five-pint gazogene three ordinary charges are ample, and these may quite safely all be put in at once. A good quantity of the gas evolved combines at once with the magnesium oxycarbonate, and if the pressure rises above a certain point the action ceases. Citric acid and potassium bicarbonate may be substituted for tartaric acid and sodium bicarbonate for generating the CO_2, and the resulting solution of potassium citrate, after driving off the carbonic acid and neutralizing, reserved for dispensing purposes. The solution of magnesium carbonate prepared under

these conditions is of full strength, and keeps as well as any other fluid magnesia.

Mentho - phenol Cocaine, Bonain's Anæsthetic Solution. (*L'Union Pharm.*, **44**, 6.) Pure crystalline phenol, 1, and menthol, 1, are mixed and warmed together on the water-bath, so that a nearly colourless syrupy liquid results. Cocaine hydrochloride, 1, is then dissolved in the solution. The clear liquid thus obtained may solidify in cold weather, but it easily redissolves on warming. It is employed to produce local anæsthesia by applying it by means of cotton wool directly to the part, the length of time necessary to establish complete anæsthesia varying with different locations. Although the liquid is but slightly caustic when applied undiluted, it becomes much more so on admixture with alcohol. That body must therefore not be used in conjunction with the anæsthetic. Bonain's solution has been found to be of special value in producing anæsthesia in operations on the ear, throat and nose.

Mercurial Ointment, Assay of. E. Bourquelot. (*Journ. Pharm. Chim.* [6], **16**, 166.) The following process for the determination of mercury in mercurial ointment will probably become official in the new Codex: Into a conical 120 c.c. flask, previously tared, introduce 1 Gm. of the ointment, and add to it 60 c.c. of ether, then 5 c.c. of alcohol 90 per cent. and 6 drops of HCl. Cover the mouth of the flask with a watch-glass and stand the vessel in tepid water until the ointment has melted; agitate carefully, and allow to stand for a short time; then decant the supernatant liquid from the mercury, which will have settled in a more or less pulverulent form on the bottom of the flask. Wash this metallic deposit several times with 10 c.c. of a mixture of 1 volume of alcohol and 2 volumes of ether. Finally wash once with ether only. After decanting this ether, transfer the small globule of mercury to a tared capsule and weigh, after the adhering ether has evaporated. 1 Gm. of ointment should yield practically 0·50 Gm. of mercury.

Mercurial Ointment, Assay of. G. Perugier. (*L'Union Pharm.*, **43**, 500.) A small portion of the ointment is first ignited in a small porcelain capsule, to ensure absence of non-volatile impurity such as slate, manganese dioxide, or heavy metals. This assured, 50 Gm. of the sample is gently melted and poured, when just fluid, into a small graduated measure previously tared. Exactly 30 c.c. is thus measured without allowing any

of the melted ointment to come in contact with the sides. The weight is then taken. That of 30 c.c. of the official mercurial ointment of the Codex, is, in round numbers, 45 Gm. Any deficiency in strength will be indicated by a weight notably below this figure.

Mercuric Oxide, Red, Preparation of, by Precipitation. E. Dufau. (*Journ. Pharm. Chim.* [6], **16**, 439.) Since red mercuric oxide, prepared by the official process of oxidizing mercuric nitrate by heat, invariably gives a product which is more or less gritty and difficult to reduce to the form of an impalpable powder, in which condition it is alone suitable for use in ophthalmic work, the author advocates the employment of the precipitated red oxide, prepared according to the method of E. Millon. Mercuric chloride, 100, is dissolved in distilled water, 500, and heated to boiling. A solution of pure K_2CO_3, 180, in water, 500, is then poured into the boiling mercurial solution. Boiling is continued until the brown precipitate at first formed acquires a deep red colour. The precipitate is allowed to subside, the supernatant liquid decanted, the HgO boiled again for a few moments with water, 500, containing KHO 15–20, allowed to subside and washed, by decantation, with water. The orange-red powder thus obtained presents, when dry, an amorphous aspect. It is volatilizable without residue. The micro-crystalline structure is very friable, so that it is readily reducible to an impalpable powder on trituration, differing in this respect from the ordinary red oxide of mercury. That it is more suitable for ophthalmic use than the official oxide is shown by the fact that a 10 per cent. ointment may be introduced into the eye without producing the least irritation. It is suggested that this form of mercuric oxide should replace that produced by oxidation in the official formula.

Mercuric Salicylate, Basic, and its Hypodermic Injections. H. Lajoux. (*Journ. Pharm. Chim.* [6], **17**, 412.) Four salicylates of mercuric are known and have been prepared, two mercurous salts and two mercuric salicylates. Of the latter, the basic salicylate, $C_6H_4\left\langle\begin{matrix}COO\\O\end{matrix}\right\rangle Hg$, is called by the author "dissimulated" mercuric salicylate on account of the modified function of the mercury, since it is not a true salt, but is combined as a constituent of the phenolic compound. For this reason the mercury is not precipitated at once by the usual chemical reagents and from the intimate manner in which it is combined in the molecule, its therapeutic action is profoundly modified. It is this basic

salicylate alone which should be used in medicine and not the neutral or normal mercuric salicylate, $Hg\ 2\left(C_6H_4\left\langle\begin{matrix}COO\\OH\end{matrix}\right.\right)$, which is a true mercuric salt and retains to the full the chemical and physiological activity of the metal. The basic salt alone has received official recognition in the Ph.G. iv. It is an energetic antiseptic, is well tolerated by the stomach, and may be given in much larger doses than normal mercuric salicylate. Thus it may be given in pills in daily doses of $\frac{3}{4}$ to $1\frac{1}{2}$ grains, and in certain cases even as much as 5 grains per diem may be administered. It has generally been given, when prescribed for hypodermic injection, in the form of a suspension in liquid petroleum. Even when thus employed, it rarely gives rise to pain or infiltrations. It may preferably, however, be injected in solution by means of ammonium salicylate or benzoate, since it is soluble in aqueous solutions containing twice its weight of these salts in the presence of a faint excess of ammonia. These solutions may be prepared thus, containing each 4 per cent. of the respective salt: Benzoic acid, 3·15 Gm., or salicylic acid, 3·561 Gm., are placed in a graduated 100 c.c. stoppered cylinder, and solution of ammonia 10 per cent. equivalent to 0·489 Gm. NH_3 for benzoic acid, or 0·439 NH_3 for salicylic acid (about 25 c.c.) is added, and distilled water 50 c.c. The cylinder is then corked and agitated to dissolve the acid, aiding the solution, if necessary, by warming on the water-bath. If the resulting solution be acid, it is neutralized by the addition of more ammonia, drop by drop. When neutral, the volume is made up to 100 c.c. To prepare the injection of basic mercuric salicylate, 1 Gm. of that compound is rubbed down in a glass mortar with 50 c.c. of the 4 per cent. solution of ammonium salicylate, or benzoate, then sufficient ammonia, 10 per cent., is added, drop by drop, to effect solution, any slight greyish insoluble matter being disregarded. The solution is then made up to 100 c.c. and filtered. Each c.c. of this injection will therefore contain 1 Cgm. of basic mercuric salicylate, equivalent to 0·00595 Gm. of Hg.

It may be noted that mercuric benzoate, which is much prescribed, is less rich in mercury, containing 45·2 per cent., than the basic salicylate, which contains 59·52 per cent. The former, too, is a true metallic salt and not an organo-metallic compound like the latter. The therapeutic and chemical difference is analogous to that between arsenious acid and the cacodylates.

To distinguish the basic salicylate from normal mercuric salicylate, the behaviour towards H_2S is sufficient. Solutions of the

basic compound are only blackened after passage of the gas for a prolonged period, and if boiled, become at first yellow, then brown, and finally throw down a precipitate of HgS. AmHS cautiously added does not affect its solutions; they turn yellow on adding a large excess. With the normal mercuric salicylate the mercury is at once precipitated as sulphide.

Mucilage of Acacia, Modified Method of Preparation. J. P. Gilmour. (*Pharm. Journ.* [4], **16**, 94.) Enclose the gum in fine muslin, and run water from a tap through it for a minute or so. Then suspend the bag from the mouth of a suitable vessel in the requisite quantity of water, so that the gum is just covered. Raise the bag occasionally as its contents diminish. Solution is completed in the course of a night, and if the gum be pure and clean, filtration through flannel is seldom necessary.

Nutritive Lemonade. (*Edinburgh Medical Journal*, after *Therap. Gaz.*, **26**, 618.) Leftwich advocates the use of the following nutritive lemonade for invalids, especially for children, suffering from febrile diseases. It is very palatable, and is rather more nutritive than "beef tea." Two lemons are peeled twice, the inner white peel rejected, and the yellow peel with the sliced fruit placed in a quart jug with, say, two lumps of sugar. Pour boiling water on them, and stir occasionally. When cooled to the temperature of ordinary tea, insert an egg whisk, and slowly add the whites of two new-laid eggs. Continue whisking for two or three minutes, and strain while still hot through muslin. Serve when cold. For non-febrile patients with clean tongues two or more eggs may be used for a pint of the liquid, and the nutritive value thereby increased. In typhoid, the use of this lemonade in conjunction with the free administration of milk serves as a valuable means of maintaining the strength of the patient. Children, who often show an aversion to "beef-tea," readily take the lemonade. When fresh lemons are scarce, citric acid and lemon oil may be substituted for the fresh fruit.

Nux Vomica Preparations, Fat-Free. W. Carter White and J. G. C. Lock. (*Chem. and Drugg.*, **6**, 87.) 10 lbs. of nux vomica powder was exhausted as directed in the Pharmacopœia, the alcohol recovered by distillation, and to the residue, whilst still hot, was added sodium hydroxide 1 oz. in 5 ozs. of water, the solution being stirred vigorously and allowed to stand for an hour. At the expiration of that time 3·5 ozs. of hydrochloric acid in 5 ozs. of water was added. This is more than is required to neutralize

the alkali, but greatly adds to the brightness and keeping-properties of the tincture. The solution was again stirred well, and allowed to stand for 12 hours. The extract was then strained through flannel, and the amount of strychnine in the solution estimated. It was found to be 4·1 per cent., and produced 109·33 ozs. of liquid extract, the volume being made up with 90 per cent. alcohol. This produced a bright tincture, free from opalescence, which did not deposit upon keeping or by exposure to variable temperatures.

The extract yielded, upon evaporation in a water-bath, a residue which was readily powdered and, when mixed with milk-sugar kept an indefinite period.

Upon making an examination of the removed fatty matter, which weighed 2·4 ozs., it was found to contain 4·3 per cent. of strychnine, of which 3·9 per cent. was recovered by mixing with two successive quantities of 5 ozs. of water containing 5 per cent. of hydrochloric acid, heating to 80°C. for 10 minutes, straining as before, evaporating, and adding to the extract. The 2·4 ozs. was equivalent to 6·2 ozs. of liquid extract. The substance was almost wholly soluble in absolute alcohol, turning a yellowish-green colour upon the addition of sodium hydroxide. Upon neutralizing with hydrochloric acid, the yellowish-green colour (which in all probability was due to copper from the still used in the first place) disappeared, and the fatty matter was again reprecipitated from the alcohol.

Upon percolating another 10 lbs. of nux vomica (from the same batch) with 70 per cent. alcohol containing 1 per cent. of hydrochloric acid, the amount of fatty matter was reduced to 0·9 oz. The de-fatting process was carried out as in the previous method, using alkali and acid in the required proportions, when a fat-free extract containing 4·401 per cent. of strychnine was obtained, which produced 117·36 ozs. of liquid extract. The 0·9 oz. of fatty matter yielded 2·4 ozs. of liquid extract, therefore the total product was 119·76 ozs., an increase of 5 per cent. upon the official process.

Ointments containing Powders, Method of Compounding. A. Astruc and J. Robert. (*Répertoire* [3], **15**, 149.) The powder to be incorporated with the fatty base, for instance, zinc oxide, is first rubbed down and sifted through a fine silk sieve, and the prescribed quantity weighed off. A small quantity of alcohol is then placed in the mortar to be used for mixing, the pestle moistened with the same, and the alcohol ignited. When a few drachms of

the alcohol have burnt away, the flame is extinguished and the mortar swabbed out with a pad of absorbent cotton. A few drachms of the basis is then placed in the hot mortar, rubbed round its sides, and the sifted powder gradually incorporated therewith. When a perfectly smooth mixture is obtained, the rest of the basis is added. In this manner a perfectly smooth ointment may be prepared in a very short time. Moreover, the burning out of the pestle mortar previous to the mixing of the ointment ensures perfect sterilization of the vessel.

Oily Collyria. A. Terson. (*Répertoire* [3], **15**, 4.) The use of oil as a vehicle for certain collyria is strongly advocated. In the case of *eserine* not only is a solution of that base in olive or earth-nut oil much better tolerated than an aqueous solution, but the preparation is more stable, since eserine is not changed, forming rubreserine in oily solutions, as is the case when water is employed as a solvent. Oily solutions of eserine remain perfectly sterile, and may be kept indefinitely. The same advantage of stability is also found with *atropine* in oily solution. There appears to be less tendency to the sequence of conjunctivitis after its use than when the ordinary aqueous solution is employed. It is also more active and better tolerated in the same dose. *Cocaine*, however, appears to be an exception, since anæsthesia is not so complete as with an aqueous solution. The oily vehicle has the disadvantage, too, of rendering the parts slippery, so that they are less easily manipulated in the course of an operation. Bignon, however, recommends the use of a 2 per cent. solution of cocaine alkaloid in vaseline oil, which is stated to possess superior anæsthetic activity. *Basic lead acetate* solution, combined with olive oil, may be used with advantage in ophthalmic practice, as pointed out by Deval, as long ago as 1850. In this form it may be exhibited in relatively large doses, without causing smarting or inconvenience. Generally speaking, oil is preferable to water as a vehicle for ocular applications, and these preparations have the further advantage of remaining permanently sterile.

Oleates, Oleopalmitates and Oleostearates, Metallic in Powdered Form. F. E. Niece. (*Amer. Journ. Pharm.*, **74**, 80.) The so-called powdered "oleates," in reality oleopalmitates or oleostearates, are much used in dermatological practice. Of these, powdered zinc oleostearate is taken as a type. Zinc acetate, 200 grains, is dissolved in 2 ozs. of distilled water. A solution of potassium oleostearate is next prepared as follows: (*a*) Potassium hydrate, 80 grains, is dissolved in alcohol 95 per cent. 2 fl. ozs.;

(*b*) Stearic acid, 425 grains, is heated in a glass vessel to its melting point. Oleic acid, 80 grains, previously heated just to its boiling point, is mixed with it, followed by hot alcohol 95 per cent., 3 fl. ozs. Solution should be complete. The hot solution is then mixed with solution (*a*) previously heated to the boiling point and thoroughly agitated. The resulting soap is dissolved in 2 pints of boiling water and well stirred. When complete solution is obtained, the zinc acetate solution, previously heated to near boiling, is poured in with constant agitation, and the stirring continued while the mixture cools. 2 pints more boiling distilled water are then added, and stirring again continued until the mixture is cool. The precipitate is then thrown on to a cloth strainer, and washed with warm water until the filtrate is neutral and free from potassium acetate. The precipitate is then drained and allowed to dry on the cloth, suspended in a warm place. When dry, it is triturated to a fine impalpable powder. Similar preparations of other metals may be obtained by substituting their acetates for the zinc acetate in the above formula. Oleopalmitates are obtained by substituting 450 grs. of palmitic acid for the quantity of stearic acid above prescribed.

Peptonate of Iron and Managanese Solution. C. A. Jungclassen. (*Apoth. Zeit.*, **17**, 755.) Peptone, 7, is dissolved in distilled water, 63, and the solution added to solution of dialyzed iron (Ph.G.), 180, previously warmed on the water-bath. Warming thus is continued until a perfectly limpid solution is obtained. Meanwhile, peptone, 18, is dissolved, in a similar manner, in distilled water, 162, and 10 per cent. solution of manganous chloride, 37·5. The warm solution of iron peptonate is poured gradually, with constant stirring, into the manganese solution, still maintained on the water-bath. Heating is continued until a portion of the mixture being withdrawn gives a perfectly clear solution when diluted with 20 volumes of distilled water. The weight is then made up to 1,000. The solution thus prepared contains 0·6 per cent. of Fe., and 0·1 per cent of Mn.

Phenosalyl. Jaudon. (*Journ. Pharm. d'Anvers*, **58**, 409.) Two formulæ are given, differing slightly in strength, both of which are stated to give soluble products of active germicidal and antiseptic action.

No. 1. Crystalline phenol, 600; lactic acid, 200; benzoic acid, 100; salicylic acid, 100; sodium glyceroborate, 200; glycerin, 300; distilled water, 150; magnesia, 20; parts by weight. Weigh the glyceroborate, glycerin, and distilled water in a flask;

add the benzoic and salicylic acids with gentle heat; add the magnesia in small quantities at a time; continue heating until effervescence has ceased and all the water has evaporated. Then add the lactic acid and the phenol; cool, and lastly, add menthol, thymol and eucalyptol, of each 1 part.

No. 2. Crystalline phenol, 500; lactic acid, 50; boric acid, 100; benzoic acid, 50; salicylic acid, 50; glycerin, 250; distilled water, 100; calcined magnesia, 10; parts by weight. Proceed as directed above, and when cold add thymol, eucalyptol and menthol of each 1 part.

Percolation as a Means for the Extraction of Official Drugs. W. H. Lenton. (*Pharm. Journ.* [4], **16**, 389, 457.) *Coca.* As the result of a very thorough examination of the official method for producing *Extractum Cocæ Liquidum*, the author concludes that, in the main, the process is satisfactory, but suggests that the prescribed quantity of leaves (20 ozs. or 1,000 Gm.) should be moistened with 10 fl. ozs. or 500 c.c. of the menstruum, instead of with 2 pints or 2,000 c.c. of the menstruum (alcohol 60 per cent.) in the initial stage of the process. This modification ensures the presence of a higher percentage of alkaloids in the "reserve." (See also p. 270, *ante.*)

Cimicifuga. The same modification is advised in preparing *Extractum Cimicifuga Liquidum*, 10 fl. ozs. or 500 c.c. of alcohol 90 per cent. being employed to moisten 20 ozs. or 1,000 Gm. of the drug, since the reserve will then contain a larger proportion of solid residue.

Aconite. As in the preceding experiments with coca and cimicifuga, it is found that a liniment richer in alkaloid may be obtained by moistening the drug with half the prescribed quantity of alcohol 90 per cent. previous to percolation. Thus for the quantity of drug, 20 ozs. or 500 Gm. given in the official formula, 10 fl. ozs. of alcohol or 250 c.c. should be used for moistening. The following is the method employed for the determination of alkaloids in the experiments which led to this conclusion:—

Assay Process Used for Aconite Percolates and Liniment. 20 c.c. of the stronger percolates, or 50 c.c. of the weaker percolates, or liniments, is evaporated at a low temperature (never exceeding 50°C.), aiding the removal of the alcohol by means of a current of air directed over the surface; 5 c.c. of water is added towards the end of the process, and after allowing the contents of the dish to cool, 10 c.c. of 1 per cent. sulphuric acid is added, and finally 10 c.c. of ether-chloroform. After well stirring with a

glass rod, to dissolve particles of resin and oil which have been precipitated by the water and acid, the whole is transferred to a separator, the dish well rinsed with 5 c.c. of the acid and 5 c.c. of ether-chloroform, and the rinsings added to the contents of the separator. This is then gently agitated so that emulsification may be avoided. If the mixture be at all violently shaken, an emulsion is produced which takes a considerable time to separate; with chloroform alone emulsification is even worse. The agitation with ether-chloroform is repeated, using 10 c.c. The ethereal solutions are mixed and extracted twice with 5 c.c. of acidulated water, which is then added to the first acid solution. The total acid liquid is made distinctly alkaline with ammonia, and shaken out four times with ether-chloroform, using 20 c.c. the first time, and 10 c.c. each time subsequently. The mixed ethereal solutions are washed with 2 c.c. of water containing a drop of ammonia, and then evaporated to dryness in a tared dish; the residue is allowed to remain in a desiccator for about 24 hours previous to weighing. If chloroform alone be used the weight of alkaloidal residue is practically the same as with ether-chloroform, but there is greater danger of emulsification occurring. The first alkaline liquor may be shaken violently for 5 minutes with ether-chloroform without forming any emulsion; in the case of chloroform, however, greater care must be taken.

Incidentally it was found that commercial liniment of aconite is far from being constant either in alkaloidal strength or in the amount of extractive it contains, as the following table will show:—

—	Gm. of Alkaloid in 100 c.c.	Solid Residue in 100 c.c.
No. 1	0·165	7·220
No. 2 (Meth.) .	0·058	3·820
No. 3 (Meth.) .	0·342	9·780
No. 4	0·310	2·560
No. 5	0·265	8·680
No. 6 (Meth.) .	0·205	6·440

It seems desirable that some standard for total alkaloid should be fixed; probably 0·25 or 0·3 per cent. could be attained without difficulty.

Phosphorated Resin. H. A. B. Dunning. (*Proc. Amer. Pharm. Assoc.*, **50**, 514.) The required properties of a solid sub-

stance to mix with phosphorus, to facilitate its manipulation, are that it should fuse at the temperature obtained by use of the water-bath, the fused material to become and remain sufficiently fluid, at that temperature, to permit of the thorough distribution of the melted phosphorus, and, at a somewhat lower temperature, become viscid, and finally of a consistence hard enough to allow the mass to be cut into small pieces of convenient size without sticking.

The following formula gives these requirements: Oil of sweet almond, 1 part; resin, 8 parts; yellow wax, 2 parts. Melt the resin by the aid of direct heat; add the yellow wax and remove from the fire; add the oil. Strain sufficient of the mixture, while stirring, into a strong wide-mouthed bottle of such size as to prevent it being more than three parts full, and then allow to become cool. Weigh the phosphorus, 4 or 10 per cent. under water, dry with filter paper, and drop into bottle containing cold resin mixture, then quickly cork and tie with twine. Place the bottle in a water-bath, so that it will not rest directly upon the bottom, and heat water gradually to boiling. Continue the boiling until contents are quite fluid. Now shake until satisfied that the phosphorus is thoroughly distributed; continue the shaking until the contents of the bottle become too viscid to shake. If desired, the above may be repeated.

After the now finished product has become entirely cold, the bottle is to be broken, the mass freed from adhering glass, cut into small pieces, placed in a stock bottle, and covered with water to prevent oxidation.

The quantity representing the amount of phosphorus desired can be easily and carefully weighed without loss of phosphorus, and may be incorporated into pill masses with ease and certainty, as substances of like physical character are usually incorporated.

Picric Acid Stains, to Remove. Dumazeaud. (*L'Union Pharm.*, **43**, 503.) To remove stains of picric acid from linen or similar fabrics, the dissolved portion should be covered with magnesium carbonate; a few drops of water should then be added, so as to form a soft paste, and the stain gently rubbed therewith. In a short time the stain, if recent, will disappear. The other side of the fabric should then be treated in a similar manner.

Protargol, Incompatibility of with certain Alkaloids and Salts. Cambe. (*Répertoire* [3], **15**, 160.) Astruc and Cambe have shown that the precipitate caused by protargol with solutions of cocaine hydrochloride may be prevented by dissolving the alkaloidal salt in a 1·5 per cent. solution of boric acid. With eucaine-

B the latter author finds that the formation of a precipitate may be avoided by dissolving the two salts separately, warming the eucaine-B solution slightly, and adding it to the cold protargol solution. Nervanine and eucaine-A solutions may be mixed, without precipitation, with cocaine hydrochloride dissolved in a 3 per cent. solution of boric acid. With holocaine hydrochloride, although no precipitate is formed in the presence of boric acid, the solution appears turbid by reflected light, but is clear with transmitted light. As pointed out by Desvignes, protargol is incompatible with zinc sulphate; but the precipitate formed is not, as supposed, due to the alkalinity of the protargol, but consists of that substance itself, which is thrown out of solution. Other metallic salts with a feeble acid reaction, such as $CuSO_4$, Al_23SO_4, $Pb2NO_3$, and Na_2HPO_4, the same precipitation occurs, which does not, however, take place with neutral or alkaline salts.

Pyramidon, Incompatibility of with Gum Acacia. (*Journ. Pharm. d'Anvers*, **58**, 420, after *Bull. Soc. Pharm. de Bordeaux.*) P. Tanzi has pointed out that when pyramidon is prescribed with mucilage of acacia, the mixture at first shows a bluish violet colour, then violet, and finally a yellow tint. Deniges shows that this is due to an oxydase in the gum acacia. He finds that the difficulty may be overcome by using mucilage, or powdered gum, which has previously been heated to about 80°C. for a few minutes. The oxydase is destroyed at this temperature, and the colours are not developed when the previously heated gum is brought into contact with pyramidon.

Quinine, to Disguise the Taste of. Borde. (*Gaz. des Hopit.*, through *L'Union Pharm.*, **44**, 223.) Quinine sulphate, 1, is rubbed down in a mortar with olive oil, 8. 20 drops of this suspension is poured into the centre of a tablespoon half filled with sweetened milk. The dose is then swallowed, followed immediately by a draught of some beverage. Even if this draught be not given, the bitter taste left on the palate is but slight; the oily mixture may be given alone, without milk, not leaving any marked bitterness in the mouth. This method of administering quinine has proved very useful with young children, the majority of whom evince a strong repugnance to bitter medicines.

Resin Plaster and Soap Plaster. J. P. Gilmour and H. Rodwell. (*Pharm. Journ.* [4], **16**, 94.) The B.P. directs that the ingredients should be melted at the lowest possible temperature. But the soap simply refuses to melt; it chars first. The following modification is recommended: Hard soap in powder; resin,

broken small; lead plaster, B.P. proportions. Melt together in the water-bath with occasional stirring. The use of shredded hard soap answers fairly well, but if any pieces of soap escape shredding they are apt to appear as nodules in the plaster, even if the latter be prepared in a mortar on the water-bath and the mass rubbed down every few minutes with a warm pestle.

Saccharin, Solution of. (*Bulletin of Pharmacy*, through *Chem. and Drugg.*, **61,** 1062.) E. P. Ferté says ammonia is better than sodium bicarbonate in making soluble saccharin. The method advocated is to dissolve 1 part of saccharin in 4 parts of liquid ammonia, evaporate off the excess of ammonia at 70°C., and make up to 5 parts with water. This makes a useful sweetener for elixirs containing a great amount of vegetable extractive.

Salts, Official Solubility of. P. W. Squire and C. M. Caines. (*Chem. and Drugg.*, **61,** 944.) Notable discrepancies having been observed in the case of ammonium phosphate and zinc sulphocarbolate between the results of the experiments of P. W. Squire, and Greenish and Upsher Smith (*Year-Book*, **1901,** 205; **1902,** 252), the latter finding the solubility of ammonium phosphate to be 1:0·76, and of zinc sulphocarbolate 1:2·7, the authors have re-investigated the matter.

Ammonium Phosphate. Eight samples of commercial ammonium phosphates were examined with the following results:—

—	1 in 0·76.	1 in 1.	1 in 1½.
No. 1	A large qty. undissolved	Still some undissolved	Not completely dissolved
No. 2	A large qty. undissolved	Still some undissolved	Not completely dissolved
No. 3	A large qty. undissolved	Still some undissolved	Completely dissolved
No. 4	A large qty. undissolved	Still some undissolved	Completely dissolved
No. 5	A large qty. undissolved	Still some undissolved	Completely dissolved
No. 6	A large qty. undissolved	Still some undissolved	Not completely dissolved
No. 7	A large qty. undissolved	Still some undissolved	Completely dissolved
No. 8	A smaller qty. undissolved	Completely dissolved	Completely dissolved

—	1 in 2.	1 in 3.
No. 1	Completely dissolved	Completely dissolved
No. 2	Not completely dissolved	Completely dissolved
No. 3	Completely dissolved	Completely dissolved
No. 4	Completely dissolved	Completely dissolved
No. 5	Completely dissolved	Completely dissolved
No. 6	Completely dissolved	Completely dissolved
No. 7	Completely dissolved	Completely dissolved
No. 8	Completely dissolved	Completely dissolved

In no instance did a sample completely dissolve according to the figure given by Greenish and Smith, viz., 1 in 0·76. In each case a residue was left undissolved which varied considerably in quantity in the different commercial samples; in the case of sample No. 1 it constituted quite half the salt originally added, and as this sample corresponded in all respects with the B.P. description, it may be regarded as the official salt.

Squire's *Companion* gave 1 in 2 from the first edition (1864) to the fifteenth (1890), and 1 in 3 in the later editions. The authors have not been able to trace the cause of the alteration. Greenish and Smith state that their figure was not obtained by using the normal Pharmacopœial salt, but by calculation from results obtained with a salt containing an excess of phosphoric acid. It is found that the solubility of the normal B.P. salt is 1 in 2, and of the normal acid salt 1 in 3, but a mixture of the two dissolved in much less water, varying with the composition of the mixture: one containing 75 per cent. of the alkaline salt and 25 per cent. of the acid salt had a solubility of nearly 1 in 1.

Zinc Sulphocarbolate. The figure given for this salt by Greenish and Smith is 1 in 2·7. A stock sample gave a solution 1 in 2 (which is the *Companion* figure). three other commercial samples from manufacturing chemists were obtained. Each sample was ordered as zinc sulphocarbolate B.P. Each of these 3 samples gave a solution 1 in 2 of water. A recrystallized salt was prepared, and this also dissolved 1 in 2. To explain the discrepancy between the *Companion* figure and that of Greenish and Smith an inquiry into the composition of the salt seemed necessary. The amount of anhydrous zinc sulphocarbolate present in each sample was determined by precipitating the zinc as carbonate and weighing as oxide, which was calculated into anhydrous zinc sulphocarbolate; 80·8 parts ZnO correspond to 408·5 parts of anhydrous zinc sulphocarbolate:—

No. 1, a sample labelled "Zinci sulphocarbolat. B.P." 5 Gm. yielded 0·733 Gm. zinc oxide, equivalent to 74·11 per cent. anhydrous zinc sulphocarbolate and 25·89 per cent. water.

No. 2, a sample labelled "Zinc. sulphocarbolate." 5 Gm. yielded 0·735 Gm. ZnO, equivalent to 74·30 per cent. anhydrous zinc sulphocarbolate and 25·70 per cent. water.

No. 3, a sample labelled "Zinc. sulphocarb. B.P." 5 Gm. yielded 0·732 Gm. zinc oxide, equivalent to 74·01 per cent. anhydrous zinc sulphocarbolate and 25·99 per cent. water.

No. 4, a sample labelled "Sulphocarbolate of zinc B.P." 5 Gm. yielded 0·731 Gm. zinc oxide, equivalent to 73·90 per cent. anhydrous zinc sulphocarbolate and 26·10 per cent. of water.

No. 5, a recrystallized zinc sulphocarbolate prepared in the laboratory. 5 Gm. yielded 0·735 Gm. zinc oxide, equivalent to 74·30 per cent. anhydrous zinc sulphocarbolate and 25·70 per cent. water.

All the above samples dissolved in 1 in 2 of water.

No. 6 was obtained by carefully drying sample No. 2 at 105–110°C. 5 Gm. yielded 0·840 Gm. zinc oxide, equivalent to 95·04 per cent. anhydrous zinc sulphocarbolate and 4·96 per cent. of water. This, on being treated in the usual manner with water, was found to dissolve 1 in 2·7. The experiment was commenced by adding 2 parts of water to 1 of the salt, and gradually adding more water until it completely dissolved at 1 in 2·7, the sp. gr. of the solution being then 1·160.

The foregoing results are tabulated for more ready comparison:

Salt.	Per cent. of Zinc Sulphocarbolate Anhydrous.	Per cent. of Water.
$Zn(OH.C_6H_4.SO_3)_2,H_2O$	95·81	4·19
$Zn(OH.C_6H_4.SO_3)_2,8H_2O$	74·07	25·93
Sample No. 1	74·11	25·89
Sample No. 2	74·30	25·7
Sample No. 3	74·01	25·99
Sample No. 4	73·90	26·10
Sample No. 5	74·30	25·70
Sample No. 6	95·04	4·96
Greenish and Smith's sample	73·66	26·34

Greenish and Smith determined the solubility of zinc sulphocarbolate in water by making a saturated solution of the salt and precipitating this with sodium carbonate, calculating the result into $ZnOH.C_6H_4.SO_3)_2,H_2O$, but their previous experiment had shown that the salt they operated upon contained 26·34 per cent. of water. They did not note the fact that the Pharmacopœia formula did not agree with the salt they were using. It is clear from the B.P. description of the salt that the formula should read $8H_2O$, instead of H_2O as crystalline zinc sulphocarbolate should contain this quantity of water. The salt loses $7H_2O$ pretty readily at 105–110°C., but the last molecule of water requires a higher temperature, and is driven off with difficulty.

Senega Infusion, Incompatibility of with Codeine. Ciupercesco. (*Bull. Soc. Pharm. de Rouman.*, through *Répertoire* [3], **15**, 219.) The author has observed that the addition of syrup of codeine to infusion of senega produces a greenish colour. This is attributed to the saponin, senegin, which gives a green colour with alkalies. Since free codeine has an alkaline reaction, it reacts in this manner. The presence of an acid prevents the formation of the colour.

Silver Salts, Hypodermic Injections of. (*L'Union Pharm.*, **43**, 505.) The following injection is prescribed by Jacoby in the treatment of tabes: Silver chloride, freshly precipitated, 6 Cgm.; sodium hyposulphite, 3 Cgm.; distilled water, 10 Gm. Mix, filter and preserve in a non-actinic glass bottle. The following solutions may also be used: (*a*) Silver phosphate, 1 Cgm.; phosphoric acid, 6 Cgm.; distilled water, 10 Gm. (*b*) Silver pyrophosphate, 1 Cgm.; phosphoric acid, 36 Mgm.; distilled water, 10 Gm.

Soap, Some New Preparations with. M. I. Wilbert. (*Amer. Journ. Pharm.*, **74**, 587.) A soap containing formalin for disinfecting purposes and for making antiseptic solutions, may be prepared as follows. Oleic acid, 110 fl. pts.; alcohol, 60 fl. pts.; potassium hydrate, 20 pts.; distilled water, 60 fl. pts.; formic aldehyde solution, 40 per cent., 250 fl. pts.

To the oleic acid, in a suitable bottle, add the alcohol. Dissolve the potassium hydrate in the water, and add gradually to the mixture of oleic acid and alcohol, occasionally shaking the mixture. Allow the mixture to stand for from 12 to 24 hours then add the formic aldehyde solution.

This formula gives a clear sherry-coloured liquid which appears to stand well, and is freely miscible with water or alcohol. This preparation has been named "sapoform."

As stated above, formaldehyde soap solutions have been used quite extensively in Germany, and are recommended as being antiseptic, disinfectant and bactericidal. They are said to be non-poisonous and non-caustic. In solution, they have been used in place of solutions of corrosive sublimate or carbolic acid. They are applied locally for night-sweats of phthisis, and also in cases of excessive perspiration, especially of the feet.

German practitioners recommend 2 or 3 per cent. solutions of the preparation in distilled or soft water.

Sapoform carbolic acid is made by adding carbolic acid, 1 part, to sapoform, 2 parts. A preparation similar to this is being

used in several of the German hospitals, and, according to the published reports, with considerable success.

This is to be used in the same manner as simple sapoform, in 2 or 3 per cent. solution in water.

The water used for diluting any of these antiseptic solutions containing soap is of considerable importance. To obtain perfectly clear solutions it should be perfectly pure, or at least free from any of the well-known soap precipitants, such as lime or alumina.

Ammonia soap may be utilized in making a preparation to sell as a clothes cleanser or grease eraser.

Oleic acid, 50; ether, 25; chloroform, 25; benzine, 250; and spirit of ammonia, 50, are mixed in the order given with occasional shaking. If a white emulsion is preferred, the same or double the amount of solution of ammonia may be substituted for the spirit, the excess of alkali in this case being rather an advantage.

Saponaceous menthol solution. H. Kuhl (*Pharm. Zeit.*, **1902,** 710) gives a formula for a preparation of this kind, as follows: Menthol, 1 pt.; Chloroform, 5 fl. pts.; spirit of camphor, 10 fl. pts.; alcohol, 20 fl. pts.; soft soap, 15 fl. pts.; oil of wintergreen, 2 fl. parts. Mix. This makes an agreeable and cooling lotion that may in many cases be recommended in place of menthol cones, or menthol pencils, for neuralgias or headaches. (See also *Year-Book*, **1901**, 201.)

Sodium Lactate Solution for Dispensing. Manseau. (*Bull. de la Soc. de Bordeaux*, **42**, 54.) This salt, which is frequently prescribed in Continental medical practice in aqueous solution, either alone or combined with sodium arsenate, is not met with in commerce in a form suitable for medicinal use. As usually obtained, by the double decomposition of calcium lactate and sodium carbonate, it is either acid in reaction or contains notable quantities of lime. As thus prepared, too, in the form of a glassy mass, it is not convenient to handle, since it is almost impossible to remove it from the containing bottles without breaking them. To obviate these undesirable features, it is proposed to employ for dispensing a 50 per cent. solution, obtained by neutralizing a known weight of the syrupy acid with sodium bicarbonate, aiding the reaction and the accompanying evolution of CO_2 by the heat of the water-bath and the addition of a little water. When reaction is complete and the liquid, after driving off the last traces of CO_2, is neutral to litmus, sufficient water is added to produce a 50 per cent. solution of the salt. The solution thus obtained keeps well without alteration, and is very convenient for use.

Surgical Silk Sterilization of. E. Debuchy. (*Journ. Pharm. Chim.* [6], **17**, 17.) An absolutely sterile silk may be obtained by first washing the strands in 3 per cent. solution of caustic soda, then removing all excess of alkali by washing, and finally sterilizing in an autoclave with steam, at a pressure of about 7 lbs. The sterile silk thus obtained may be preserved in a 2.5 per cent. solution of phenol or in a mixture of alcohol 90 per cent., 900; glycerin, 100; mercuric chloride, 1. Thus preserved, the silk remains perfectly sterile, supple, and resistant.

Syrup of Codeine Phosphate, Modification of the Process for Preparing. J. P. Gilmour. *Pharm. Journ.* [4], **16**, 96. Squire states that the quantity of water ordered by the B.P. to dissolve the codeine phosphate is insufficient. He overcomes the difficulty by increasing the water. There is no objection to this, but if the water in the B.P. proportion be warmed, solution is readily effected. As the solution is added forthwith to the syrup, there is no chance of the salt separating out. And since the phosphate is one of the most stable salts of morphine, the heating of the aqueous solvents is perfectly legitimate.

Syrupus Hypophosph. Co., B.P.C., and Liquor Ferri Hypophosph. Fort., Notes on. H. J. Henderson. (*Pharm. Journ.* [4], **15**, 552.) Whenever possible, a pharmaceutical syrup should be bright and free from suspended matter, and viewed from this standpoint the *Syr. hypophosph. Co., B.P.C.*, is by no means a triumph of the pharmacist's art. If the directions for its preparation be literally followed, the finished product has a cloudy appearance, which in a short time resolves itself into a white precipitate. After the lapse of a few weeks this precipitate can only with difficulty be re-distributed through the bulk.

If this cloudiness was deliberately arranged so as to produce an article which should correspond in appearance to a well-known proprietary syrup, then it must be classed as a failure, for the two precipitates are totally unlike. It is also superfluous to order the solution of the salts to be filtered. It may be said at once that it is totally unnecessary to prepare the syrup in the laboured manner directed in the Formulary. The use of concentrated liquors is to be deprecated as a rule. Yet there is no rule without its exceptions, and when it is remembered that the sugar takes nearly two days to dissolve completely, a quicker method of preparation becomes imperative. The syrup can be rapidly and easily prepared from a liquor of such a strength that 1 part added

to 3 parts of simple syrup forms the syr. hypophosph. Co., B.P.C., and this has an advantage over the B.P.C. method in reducing the quantity of the precipitate to an almost negligible quantity. A perfectly clear and bright syrup may be made by substituting 1,033 grs. of potassium citrate for the 800 grs. of citric acid ordered in the preparation of the liquor ferri hypophosph. fort., omitting the solution of ammonia. This is a recommendation from Squire's *Companion to the Pharmacopœia*, and it works perfectly. The resulting syrup is of a bright yellow tint, it keeps well, and is a most elegant preparation.

There is one other point which calls for comment in the preparation of the strong solution of ferric hypophosphite. Taking the following equation to represent the reaction—

$$\underbrace{Fe_2Cl_6}_{322\cdot34} + \underbrace{6NaPH_2O_2}_{524\cdot64} = \underbrace{Fe_26PH_2O_2}_{498\cdot56} + 6NaCl,$$

then the B.P.C. orders a great excess of iron. Ferric chloride is not defined in the Formulary, but in the appendices of the British Pharmacopœia it is defined as the pure anhydrous ferric chloride of commerce. The U.S.P., however, describes a ferric chloride of the formula $Fe_2Cl_612H_2O$, and this appears to be intended, for if this equation represents the reaction—

$$\underbrace{Fe_2Cl_612H_2O}_{536\cdot9} + \underbrace{6NaPH_2O_2}_{524\cdot64} = \underbrace{Fe_26PH_2O_2}_{498\cdot56} + 6NaCl$$

it will be seen that approximately equal parts of ferric chloride and sodium hypophosphite are required, and this seems to be what is intended in the Formulary, an excess of sodium hypophosphite being ordered to ensure the entire precipitation of the whole of the iron. The quantity of ferric chloride ordered, i.e., 1,000 grs., should therefore yield theoretically 928 grs. of ferric hypophosphite, or 23 fl. ozs. of strong liquor; in practice however, it barely makes half a pint.

Tincture of Hops. A. W. Hudson. (*Pharm. Journ.* [4], **15**, 560.) The above preparation, made with hops dried without heat, instead of the commercial kiln-dried hops, following the B.P. process, yields a superior tincture, which tastes more aromatic, and has a more fragrant odour. Commercial kiln-dried hops no doubt lose a considerable amount of their volatile oil by the heat used in drying them, which varies much in different oast-houses.

Tincture of Pyrethrum, Crystalline Deposit from. F. H. Alcock and H. W. Green. (*Pharm. Journ.* [4], **15,** 553.) A crystalline deposit of acicular crystals weighing 0·54 Gm. from a pint of tincture of pyrethrum has been examined. It was found to consist of $KH_2PO_4.H_2O$.

Traumatol Gelatin. (*Deutsch. Amer. Apoth. Zeit.*, **23,** 73.) The following dressing is prescribed by Gaudin for application to abscesses of the knee or other joints where a pliable covering is required: Traumatol, gelatin, of each, 1; glycerin, distilled water, of each, 4. The mixture is heated on the water-bath until fluid and homogeneous. The joint is first washed with soap and water, and dusted over with traumatol powder, then painted with the gelatin.

Zinol. Overlach and Guenther. (*Merck's Report*, **1902,** 170.) A mixture of alumnol (aluminium β-naphthol disulphonate) 4, and zinc acetate, 1, has been introduced under the name of zinol. It is an astringent antiseptic, being very useful in the treatment of gonorrhœal catarrh of the vagina and cervix, for which a 3 per cent. aqueous solution are employed. It also gives good results when used as a wash for bedsores, and as an irrigating wash in obstetrics. Suppurating wounds may be treated with dressings of zinol solution.

NOTES AND FORMULÆ.

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PART IV.

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Alcohol, Removal of Iron from. A. Minet. (*Journ. Pharm. Chim.* [6], **16**, 209.) Certain lots of alcohol, stored in iron drums for upwards of 20 years in French military stores, were found to have become contaminated with iron in solution, the amount of the metal reaching, in some instances, as much as 1·25 Gm. per litre. Couton has shown that iron may be removed from such alcohol by shaking it with sodium bicarbonate and decanting. The author finds that the same result may be attained by the use of a trace of tannin. Samples of the contaminated spirit preserved in stoppered bottles were observed to undergo no change; but when corks were used the iron was precipitated. Those samples which contained from 0·10 to 0·20 Gm. of Fe per litre had the tint of rum; those containing more were dichroic, being turbid to reflected light, but yielding no deposit, nor becoming clearer on filtration, and not precipitating when boiled. With a trace of NaCl, however, a gelatinous precipitate of hydrated ferric oxide was obtained on gently heating. The same result was obtained by adding a trace of H_2SO_4 or of tannin. The addition of solution of K_4FeCy_6 occasioned no precipitate of Prussian blue, but only gave a greenish colour. In a similar manner KCNS solution gave no red colour. These reactions indicated that the iron was present as the colloidal hydrate, $Fe_2O_3H_2O$. When glycerin was added to the alcohol, and the mixture was distilled at a low temperature, the colloidal ferric hydrate was left in solution in the glycerin with the same characteristic dichroic appearance.

Alum for the Prevention of Dental Tartar. C. H. Pierce (*Pract.*, **69**, 750) recommends rinsing the mouth once daily with water in which a pinch of alum has been dissolved. It is harmless to the teeth, keeps the gums in good condition, and prevents the deposit of tartar.

Anti-rust Grease for Machinery. (*Nat. Drugg.*, **32**, 277.) Dissolve camphor, 1, in melted lard, 16; mix in as much finely powdered blacklead as will impart an iron colour. Smear the machinery with this mixture. After 24 hours rub it off with a soft cloth; it will then keep clean for months under ordinary conditions.

Ants, to Destroy. (*Agricult. News*, **1**, 124.) J. B. Smith in *Economic Entomology* recommends the use of carbon disulphide to destroy ants' nests on lawns. A little of the disulphide is poured into the openings of the hill or disc, stepping on each as it is treated to close it up. The volatile vapours of the disulphide will penetrate the chambers of the nest in every direction, and, if sufficient has been used, will kill not only the adult insects, but the larvæ as well. A single treatment is generally sufficient.

Aromatic Cachous. (*Southern Drugg. Journ.*, **1**, 209.) Oil of cinnamon, 6 ♏; neroli oil, 12 ♏; peppermint oil, 30 ♏; cloves, powdered, 40 grs.; cardamom seeds, powdered, 80 grs.; vanilla, 2 drs.; orris root, powdered, 2½ drs.; mace, powdered, 6 drs.; sugar, 5 drs.; chocolate, 3½ ozs.; extract of licorice, sufficient to mass. Powder the solids, add the oils, and mass with the licorice. Roll into small pills, which may be silvered.

Aromatic Mouth Wash. (*Nat. Drugg.*, **33**, 165.) The *Drogisten Zeitung* recommends the following: Cinchona bark, 5 parts; guaiacum wood, 5 parts; alkanet root, 2·5 parts; pellitory root, 5 parts; sandalwood, 5 parts; cloves, 5 parts; myrrh, 10 parts; alcohol 60 per cent., 1,000 parts. Bruise the drugs, cover them with the alcohol, and macerate together for eight days. Filter, and in the filtrate dissolve: Peppermint oil, 5 parts; oil of sage, 1 part; cinnamon oil, 2 parts; oil of thyme, 1 part. A teaspoonful of the preparation in a wine-glassful of water.

Athenian Water. (*Amer. Drugg.*, **42**, 68.) Sodium borate, 3, dissolved in glycerin, 60; Cologne water, 40; tincture of quillaia, 100.

Beauty Blanch. (*Pharm. Era*, **28**, 526.) Distilled witch-hazel, 12; prepared cucumber juice, 12; rose water, 6; essence of white rose, 6; glycerin of borax, 4; prepared talc, 4; zinc oxide, 2; simple tincture of benzoin, 2. Mix well.

Birch Toilet Preparations. (*Nat. Drugg.*, **33**, 165.) *Birch*

Balsam: Oil of birch, 15 parts; oil of bergamot, 10 parts; oil of lemon, 5 parts; palmarosa oil, 10 parts; borax, 15 parts; glycerin, 200 parts; water, 200 parts; alcohol, 400 parts. Mix.

Birch Water—Eau de Bouleau: 1. Birch buds, 5 parts; glycerin, 15 parts; essence of spring flowers, 10 parts; potash soap, 20 parts; water, 70 parts; alcohol, 96 per cent., 350 parts.

Dissolve the soap in 140 parts of alcohol and water mixed in equal proportions, add the birch buds and essence to the remainder of the alcohol. Add the soap solution to the alcoholic mixture, little by little, under continuous agitation. Finally, add the glycerin, set aside for eight days, then filter and colour the filtrate a light yellowish green by the addition of chlorophyll with a small dash of tincture of saffron.

2. Tincture of cantharides, 25 parts; salicylic acid, 25 parts; glycerin, 100 parts; birch buds, 40 parts; oil of bergamot, 30 parts; oil of geranium, 5 parts; water, 500 parts; alcohol 96 per cent., 2,000 parts. Proceed as before.

Blood, Permanent Microscopical Preparation of. (*Nat. Drugg.*, **33**, 106.) Spread the blood as evenly as possible over the slip, and place the latter, while the film is still fresh, in a saturated aqueous solution of mercury bichloride. A little sodium chloride may be added to the solution (to increase the solubility of the bichloride). Remove, rinse in solution of sodium chloride containing three-quarters of 1 per cent. of the salt. Place in alcohol, 50 per cent., for a little while, to harden the cellular elements present, removing later to absolute alcohol. Stain with eosin first, and hæmotoxylin afterwards; the red corpuscles taking the first, while the leucocytes take the latter.

Boots, to Render Waterproof. C. F. Miller. (*Scientif. Amer.* through *Canad. Drugg.*, **36**, 260.) Heat in an iron vessel either fish oil, castor oil, or even tallow to about 250°F., then add, cut into small pieces, vulcanized or raw Indiarubber, about one-fifth of the weight of the oil, gradually stirring the same with a wooden spatula until the rubber is completely dissolved in the oil; lastly, to give it colour add a small amount of printer's ink. Pour into a suitable vessel and let cool. One or two applications of this are sufficient to thoroughly waterproof a pair of boots or shoes for a season. Boots or shoes thus dressed will take common shoe blacking with the greatest facility.

Brass Polish, Liquid. (*Neueste Erfind. und Erfahr.*, through *Nat. Drugg.*, **32**, 246.) Oxalic acid, 3; water, 50; kieselguhr, 7.

Dissolve the acid and add the earth. Label, "Shake before using."

Brilliant Black on Polished Steel. Nobis communicates to the *Neueste Erfind. und Erfahr.* the following method of putting a brilliant black coating on small articles of polished steel. Make the article perfectly free from grease and rust and put for 10 seconds—not longer—in a bath of 10 parts of copper sulphate, 15 parts zinc chloride, 20 parts of hydrochloric acid and 1,000 parts of distilled water. This is called the bronzing bath, is used cold, and is prepared thus: The copper salt is dissolved by the aid of heat in twice its weight of the water, and filtered while hot into the remainder of the water. Add the hydrochloric acid and the zinc salt, let dissolve and set aside.

Make another bath as follows: Sodium hyposulphite, 1,500 parts; hydrochloric acid, 75 parts; water, 1,000 parts. Dissolve the hyposulphite in the water by the aid of heat and let cool, filter through cloth, add the acid and set aside to deposit, then pour off. The articles removed from the bronzing-bath are rinsed under running water and thrown at once into the second bath, which should not be used for at least 2 hours after it is made. Leave them in the bath from 2 to 3 minutes, then rinse them in hot water and let dry.

Bug Poison. (*Spatula*, **9**, 87.) Corrosive sublimate, 1 oz.; methylated spirit, 12 ozs.; carbolic acid, 3 drs.; water, 18 fl. ozs. Dissolve. Label, "Poison. To be used with caution."

Bumping during Boiling, Prevention of. Heyward Scudder. (*Journ. Amer. Chem. Soc.*, **25**, 163.) A capillary is made by drawing out a piece of glass tubing until the internal diameter is about 0·5 to 1 mm. A seal is then made by holding the tube horizontally in the edge of the flame of a Bunsen burner, until the walls have melted together. The tube is bent, if necessary, or held horizontally till cold. For most purposes the seal should be about 1 cm. from the open end of the tube. The tube is cut off at the desired length and the other end sealed to prevent the entrance of liquid. When cold, the tube is placed open end down in the liquid to be boiled. The open end should rest on the bottom of the vessel containing the liquid and should remain there during use. When liquids of high specific gravity are being boiled, it is necessary, therefore, to have the capillary so heavy that it will not be thrown off the bottom. This weight can be

obtained by drawing out the tube from which the capillary is made only near the seal, or by using a very thick walled tube.

In a general way the theory of the action of such a tube is that when heated the air in the capillary expands and passes through the liquid in bubbles. The vapour of the liquid gradually replaces the air and the stream of bubbles is continuous as long as the temperature around the capillary is at the boiling point of the liquid. This constant bubbling prevents superheating and consequent explosive boiling. It is apparent that the size of the bubble will depend chiefly on the width of the capillary. This should vary with the nature of the liquid. For liquids of low boiling-point, or for frothing liquids, a narrow capillary is best, while for heavy liquids a wider capillary (even as wide as 5 mm. internal diameter) is more suitable.

When boiling with a return condenser, the seal of the capillary *must* be below the surface of the liquid. If the seal is above the surface, cold drops falling back from the condenser will strike the capillary and cause condensation of the vapour inside it, thus stopping the stream of bubbles. To prevent displacement, the capillary should be of such a length that the upper end reaches nearly to the top of the neck of the flask. When the liquid is in a thin broad layer the capillary should be bent at the seal so as to be parallel or nearly parallel to the bottom of the flask. In boiling liquids in a test-tube, care must be taken that the heat is applied at the bottom of the tube. The capillary is useless unless completely filled. Therefore it must be cold and empty when placed in the liquid. Care should be taken, especially in the case of liquids that bump badly, to protect the flame from draughts.

This method has been in successful use for nearly a year. By its use it is possible to saponify esters by boiling with a 50 per cent. solution of potassium hydroxide (using a return condenser) or to boil concentrated sulphuric acid in a test-tube, without any bumping. Only two cases have been met with in which bumping persisted after the capillary was introduced. Both were reactions carried out with a return condenser. Although the bumping continued, it was so greatly lessened that the liquid was not thrown out of the upper end of the condenser and there was no danger of having the flask broken.

Carmine, Drawing-Ink. (*Nat. Drugg.*, **32**, 277.) Triturate carmine, 1, with solution of ammonium acetate, 15, and distilled water, 15, in a porcelain mortar, and allow the mixture to stand

for some time. Filter, and add a few drops of simple syrup to bring the solution to the requisite consistence.

Cement, Acid-proof. (*Nat. Drugg.* **33,** 37.) An acid-proof cement, or application for wood, metals, etc., is, according to the *Pharm. Centralh.*, as follows: Powdered asbestos, 2; ground baryta, 1; sodium silicate solution, 2. Mix.

To withstand hot nitric acid the following is used: Sodium silicate solution, 2; sand, 1; asbestos, 1. Mix.

Cement for Marble. (*Journ. Frank. Inst.* through *J.S.C.I.*, **22,** 496.) Powdered gypsum, 4, and powdered gum acacia, 1, are mixed to a paste with a cold solution of borax. The cement sets in a few days. For coloured marble it may be tinted by adding colouring matter to the borax solution.

Cements for Porcelain, Glass, etc. (*Amer. Drugg.*, **42,** 222.) 1. Caustic lime, 10; white of egg, fresh, 25; plaster of Paris, 55; water, 10.

Reduce the caustic lime to powder, and triturate it with the white of an egg to a uniform paste. Dilute this with the water, quickly incorporate the plaster of Paris, and use the cement at once.

2. Casein, fresh, 100; sodium silicate, syrupy, q.s.

Mix the casein in a mortar with enough sodium silicate to produce a uniform honey-like mass. The addition of 5 parts of calcined magnesia to every 100 parts of this cement makes a good cementing material for meerschaum.

Cement, Waterproof. (*Drogisten Zeitung* through *Nat. Drugg.*, **33,** 60.) Alcohol (methylated) 95 per cent., 1,000; sandarac, 60; mastic, 60; turpentine oil, 60.

Dissolve the gums in the alcohol, add the oil and stir in. Now prepare a solution of equal parts of glue and isinglass, by soaking 125 parts of each in cold water until it becomes saturated, pouring and pressing off the residue, and melting in the water-bath. This should produce a volume of glue nearly equal to that of the solution of gums. The latter should, in the meantime, have been cautiously raised to the boiling-point in the water-bath and then mixed with the hot glue solution. Articles united with this substance will stand the action of cold water for an unlimited time, and it takes even hot water a long time to affect the cement.

Charlock, Eradication of. (*Chem. and Drugg.*, **62,** 835.) During the past four years experiments in spraying charlock

(*Sinapis arvensis*) have been conducted at Bangor, under the auspices of the Agricultural Department of the University College of North Wales. The efforts to suppress this persistent pest of the agriculturist have only been spasmodically successful, but the latest reports from North Wales appear to indicate that a 5 per cent. solution of copper sulphate gives the best results. In 1899 solutions of copper sulphate and iron sulphate were tried, with only partial success. Copper sulphate was, however, proved to be much more effective than the iron sulphate, and the latter in the following year was abandoned entirely. In 1900 the most effective dressing tried was a 3 per cent. solution of copper sulphate, applied in the ratio of 50 gals. to the acre. Only about 60 per cent. of the charlock was destroyed by that solution, however, and much of the weed revived. In 1901 and 1902 dressings of 3 per cent., 4 per cent., and 5 per cent. strengths were employed at seven different centres in Wales in the proportion of 50 gals. to the acre. The average percentage of weed destroyed by a 3 per cent. solution was 71, by the 4 per cent. solution 79, and by the 5 per cent. solution 86·2. It thus appears conclusive that the 5 per cent. solution (in Wales, at least) is best, and, so far as the experiments go, the damage done to the corn was not permanent. The best time to spray the solution is generally supposed to be when the charlock is in the first leaf; yet the Welsh experiments hardly bear out that idea. In North Wales the best results were obtained when the spray was used to the plant in the flowering stage. There does not appear to be any great virtue in spraying the young plants, one good dressing when the plants are in flower proving effective in most cases.

Chilblain Ointment. (*Pract.*, **69**, 748.) Creosote, solution of basic lead acetate, of each 10 ♏; extract of opium, $\frac{1}{2}$ gr.; lard, 1 oz.

Chloral Hydrate Solution in the Chemico-toxicological Examination of Foods and Drugs. Schaer. (*Pharm. Journ.* [4], **16**, 814.) In a paper read before the International Congress of Applied Chemistry in Berlin, the author alluded, first, to the use made of a strong solution of chloral hydrate for clearing vegetable preparations for examination under the microscope, this action being due to the solvent power possessed by the solution on starch, chlorophyll, and other substances; to the property chloral hydrate possesses of forming liquids when triturated with certain other solids; to its solubility in various liquids, and to the remarkable behaviour of iodine to a solution of starch in chloral hydrate.

1. *Alkaloids, Glucosides, and Bitter Principles.* Not only alkaloidal salts—in some cases even the tannate—but the pure alkaloids are soluble in chloral hydrate, which also dissolves many glucosides, bitter principles, etc.; hence this solution may be employed for isolating these substances in toxicological investigations. Owing to its strong penetrating power, the solutions, both in water and alcohol, are well adapted for extracting active principles from drugs, with the view of applying qualitative tests, or even making quantitative determinations.

2. *Gum-resins, Resins, and Balsams.* The solution has the remarkable power of dissolving both resins and gums, and hence generally yields clear solutions with gum-resins, being the only known single solvent of these. From solutions of gum-resins water separates the resin, and alcohol the gum, in each case almost quantitatively; aromatic balsams are mostly soluble in chloral hydrate, whereas turpentine and allied bodies are only partially soluble; by this means adulteration may, under certain circumstances, be detected.

3. *Volatile Oils.* Here also the solution often affords valuable information. Not only do the oxygenated constituents of volatile oils differ in solubility from the oxygen-free constituents, but the colorations observed are often very characteristic, and afford a means of identifying the oils, especially with the sesquiterpenes, in solution of chloral hydrate containing free hydrochloric acid.

4. *Fats, Waxes, Gutta-percha, and Caoutchouc.* The former exhibit considerable differences in their solubility in aqueous and alcoholic solutions of chloral hydrate. The last named yields to these solutions chiefly the foreign substances that accompany the gutta or caoutchouc.

5. *Colouring Principles.* These are generally soluble, but indigo is a notable exception.

6. *Blood.* Chloral hydrate removes the colouring matter, even from old blood stains, with great facility, and the solution obtained is well adapted for exhibiting qualitative reactions.

7. *Starch*, as is well known, swells and dissolves, but the different starches behave differently in this respect, so that certain distinctions may be drawn, especially in conjunction with microscopical examination.

8. *Albumin, Gelatin.* These swell and dissolve.

9. *Fibres*, the behaviour of which to chloral hydrate varies considerably.

Cleansing Fluid for Grease Spots. (*Chem. Zeit.*, through *Nat.*

Drugg., **32**, 246.) Oil of turpentine, 4; strong solution of ammonia, 4; spirit of soap (methylated), 2; acetic ether, 2; alcohol (methylated), 2. Mix. Label, "Shake before using."

Cleansing Preparations. (*Nat. Drugg.*, **33**, 9, after *Drogisten Rundschau.*) The following preparations are useful for removing grease spots, tar, paint, etc.:—

Universal Spot Remover. Ether, 10; benzol, 40; amyl acetate, 10; oil soap, 50; water, 700; ammonia water, 50; acetic ether, 50. Dissolve the soap in the water by the aid of heat, then incorporate the ether, benzol and amyl acetate, finally the ammonia and acetic ether. The directions for the use of this liquid should read thus: "This preparation will remove all ordinary spots or dirt from even the most delicate fabrics without injury. A little of the liquid is poured on the spot, and the material lightly rubbed together, then rinsed."

Cleanser for Grease and Oil Spots. 1. Soap spirit, 100; ammonia water, 10 per cent., 50; acetic ether, 15 parts.

Mix. Moisten the spots with the liquid, and then rub them with a woollen rag.

2. Benzine, 200; ether, 40; acetic ether, 30; oil of turpentine, 60 parts. Mix. Directions as above.

Colognes and Toilet Waters. W. L. Scoville. (*Proc. Amer. Pharm. Assoc.*, **50**, 504.) *Eau de Cologne.* This closely resembles popular "Farina" colognes usually sold in sealed packages: Oil of bergamot, 1½ fl. ozs.; oil of lemon, 6 fl. drs.; neroli oil, 4 fl. drs.; orange oil, 2 fl. drs.; oil of rosemary, 2 fl. drs.; simple tincture of benzoin, 2 fl. ozs.; orange flower water, 12 fl. ozs.; alcohol 90 per cent., q.s. to produce 6 pints, 8 fl. ozs.

Headache Cologne. The addition of menthol, 4 ozs. or more, and camphor, 1 oz., to the above formula for Eau de Cologne, gives a characteristic and effective product.

Antiseptic Eau de Cologne. Bergamot oil, 6 fl. drs.; orange oil, 1 fl. dr.; rosemary oil, 1 fl. dr.; eucalyptol, 2 fl. drs.; bornyl acetate, ½ fl. dr.; simple tincture of benzoin, 1 fl. oz.; alcohol 90 per cent., 4 pints, 8 fl. ozs.; distilled water, 2 pints.

Lilac Water. Bergamot oil, 1½ fl. ozs.; lemon oil, 6 fl. drs.; terpineol, 4 fl. drs.; orange oil, 2 fl. drs.; rosemary oil, 2 fl. drs.; simple tincture of benzoin, 2 fl. drs.; water, 12 fl. ozs.; alcohol 90 per cent., to make 6 pints, 8 fl. ozs.

Lavender Water. Lavender oil, 4 fl. ozs.; oil of bergamot, 1 fl. oz.; oil of orange, 2 fl. drs.; oil of neroli, ½ fl. dr.; coumarin, 30

grs.; simple tincture of benzoin, 1 fl. oz.; water, 16 fl. ozs.; alcohol 90 per cent., 5 pints, 12 fl. ozs.

Florida Water. Lavender oil, 2 fl. ozs.; bergamot oil, 1 fl. oz.; orange oil, ½ fl. oz.; neroli oil, ½ fl. dr.; cassia oil, 1 fl. dr.; caraway oil, 15 ♏; oil of spearmint, 15 ♏; simple tincture of benzoin, 1 fl. oz.; water, 16 fl. ozs.; alcohol 90 per cent., 5 pints, 12 fl. ozs.

Bay Rum. Myrcia acris oil, 6 fl. drs.; orange oil, ½ fl. dr.; pimento oil, ½ fl. dr.; simple tincture of benzoin, 4 fl. drs.; powdered orris root, 1½ ozs.; water, 3 pints, 4 fl. ozs.; alcohol 90 per cent., 3 pints, 4 fl. ozs. The powdered orris is used chiefly as a clarifying agent.

Violet Water. (1) Ionone, 2 fl. drs.; oil of sandalwood, 4 fl. drs.; oil of neroli, 1 fl. dr.; oil of bitter almonds, 8 ♏; oil of spearmint, 15 ♏; heliotropin, 1 dr.; artificial musk, 2 grs.; tincture of civet, 4 fl. drs.; water, 32 fl. ozs.; alcohol 90 per cent., 4 pints, 16 fl. ozs. (2) Oil of sandalwood, 4 fl. drs.; oil of bergamot, 4 fl. drs.; oil of rose geranium, 2 fl. drs.; oil of neroli, 1 fl. dr.; oil of bitter almonds, 15 ♏; musk, 1 gr.; simple tincture of benzoin, 4 fl. drs.; powdered orris root, 2 troy ozs.; water, 2 pints, 8 fl. ozs.; alcohol 90 per cent., 4 pints. Macerate 30 days, then filter.

The simple tincture of benzoin in the above formula is added as a fixative of the more fugitive floral odours. In this respect it is stated to be more effective and pleasant than musk, civet, or ambergris, formerly used for the same purpose. Only the best Siam benzoin should be employed for the purpose. (The B.P.C. tincture is the strength required.) Heliotropin is also recommended as a fixative in all bouquets where its odour harmonizes with those of the other constituents.

Cooling Cream. (*Pharm. Era*, **28**, 526.) Quince seed, 1 oz.; boric acid, 16 grs.; starch, 1 oz.; glycerin, 16 ozs.; liquid phenol, 30 ♏; alcohol 90 per cent., 12 fl. ozs.; oil of lavender, 30 ♏; otto of rose, 10 ♏; extract of white rose, 1 fl. oz.; water to make 64 ozs. Dissolve the boric acid in 32 fl. ozs. of water, and in this solution macerate the quince seed for 3 hours, then strain. Heat the starch and glycerin until the starch granules are broken; to this add the phenol. Dissolve the perfumes in the spirit, then mix all together, strain and add enough water to make the final product weigh 64 ozs.

Corks instead of Rubber for Terpene Distillation. T. H. Page. *Pharm. Journ.* [4], **16**, 349.) The use of ordinary corks coated

with thick mucilage of acacia is recommended instead of rubber corks for making connections in apparatus for distilling essential oils. It is a familiar trouble that terpenes, especially when hot, have a marked solvent action on rubber. The joint made with a gummed cork is as tight as that with rubber. The mucilage is merely applied to the surface of the cork with a brush; if the distillation is to be conducted under reduced pressure, a partial vacuum should be made so as to occlude all possible passages with the moist gum.

Cosmetic Cream. J. T. Pepper. (*Amer. Drugg.*, **42**, 157.) Quince seed, 45 Gm.; boric acid, 30 Gm.; glycerin, 600–750 c.c.; alcohol 90 per cent., 250 c.c.; distilled water, 3,000 c.c.; simple tincture of benzoin, 15 c.c.; menthol, 0·15 Gm.; essence of white rose, 10 c.c.; oil of bergamot, 1 c.c.

Macerate the quince seed and boric acid in the water for 48 hours, shaking thoroughly and frequently the while; then strain, add the glycerin, and finally the perfumes, menthol and tincture of benzoin, all previously mixed with the alcohol. With the addition of a little *Liquor hamamelidis* the preparation may be sold as witch hazel cream.

Cosmetic Vinegar, Maillard's. (*Amer. Drugg.*, **42**, 67.) Dilute acetic acid, 1,000; alcohol, 2,000; tincture of tolu, 40; tincture of benzoin, 15; bergamot oil, 15; lemon oil, 45; lavender oil, 15; rosemary oil, 5; tincture of musk, 5; rhatany root, 4. Macerate for several days, and filter.

Cosmetic Water, Lubin's. (*Amer. Drugg.*, **42**, 71.) Alcohol, 175 Gm.; tincture of orris, 70 Gm.; tincture of tolu, 35 Gm.; tincture of musk, 25 ♏; lavender oil, 30 ♏; bergamot oil, 2·5 Gm.; clove oil, 2 Gm.; ylang-ylang oil, 2 ♏.

Cresol Disinfectants. E. Baroni. (*Giorn. di Farm.*, through *Annales de Pharm.*, **8**, 495.) A cheap efficient liquid preparation similar to creolin may be obtained by dissolving resin, 200, in caustic soda solution, sp. gr. 1·332, 90; heating until saponification is complete; to this adding coal tar oil, sp. gr. 1·030–1·035, 780 previously heated to 70–80°C., and stirring thoroughly until a homogeneous mixture results; then continuing heating at 100°C. until a pellicle forms on the surface of the liquid, finally straining and allowing to cool in a covered vessel.

A solid preparation is obtained by treating, in a similar manner, Venice turpentine, 70; resin, 60; beef fat, 80; caustic soda solution, sp. gr. 1·332, 90; tar oil, sp. gr. 1·030–1·035, 750.

On saponification a mass is obtained which is readily miscible with water, giving an emulsion with an alkaline reaction.

Dentalin Paste. (*Pharm. Centr.*, **44**, 80.) Powdered Castile soap, 70; prepared chalk, 100; benzoic acid, 5; thymol, 1; peppermint oil, 4; glycerin, q.s. to mass, say 140–150. This may be filled into collapsible tubes.

Dental Vinegar. (*Amer. Drugg.*, **42**, 68.) Pellitory root, 40; guaiacum resin, 40; cinnamon bark, 5; cloves, 5; tincture of cochlearia, 200; vinegar, 700. Digest and filter, then add tincture of cochineal, q.s.

Dentenamel. (*Amer. Drugg.*, **42**, 68.) Saccharin, 1·4 Gm.; sodium bicarbonate, 1·5 Gm.; calcium carbonate precip., 350 Gm.; magnesium carbonate, 10 Gm.; powdered soap, 30 Gm.; powdered orris, 30 Gm.; thymol, 1·5 Gm.; rose geranium oil, 30 drops; wintergreen oil, 30 drops; carmine, q.s.

Dentifrice Powder, Betton's. (*Amer. Drugg.*, **42**, 222.) Cuttle bone, powdered, 4 lbs.; orris root, powdered, 4 lbs.; prepared chalk, powdered, 1 lb.; musk, 8 grs.; rose oil, 48 ♏; lavender oil, 48 ♏; carmine solution, N.F., q.s.

Dentine Wash. (*Amer. Drugg.*, **42**, 68.) Almond soap, 500; glycerin, 1,200; alcohol, 1,800; distilled water, 1,800; peppermint oil, 13; wintergreen oil, 20; clove oil, 6; tincture of vanilla, 150; solution of carmine, N.F., q.s.; quillaia bark, 300 parts.

Disinfecting Fluid. (*Bull. gén. de Thérap.*, **144**, 160.) A cheap disinfectant and antiseptic fluid for use in disinfecting floors, furniture, and vessels in the sick room or hospital ward may be obtained by dissolving zinc chloride, 100; hydrochloric acid, 3; and rain water, 200. Dissolve with heat; dilute with 10 parts of water before using.

Domestic Liniment. (*Pract.*, **69**, 748.) Solution of ammonia, 2; sassafras oil, 2; chloroform, 2; oil of turpentine, 2; clove oil, 1; spirit of camphor, 4; alcohol 90 per cent., 7.

Dressing for Patent Leather. (*Seifensieder Zeitung*, through *Nat. Drugg.*, **33**, 64.) Wax, 22; olive oil, 60; oil of turpentine, 20; lavender oil, 10. Melt the wax in the oil with gentle heat, and as soon as melted, remove from the fire. Add the turpentine oil, incorporate, and when nearly cold, add the lavender oil.

Eau de Cologne, New and Cheap. T. Maçon, in *Seifensieder Zeitung* (*Nat. Drugg.*, **33**, 102), gives the following improved formulæ: 1. Oil of bergamot, 20; oil of lemon, 30; oil of thyme, 2; oil of rosemary, 2; oil of lavender, 1; alcohol 90 per cent., 3,000; distilled water, 5,000. Dissolve the essential oils in the alcohol and add the water, little by little, with constant agitation. Then add about 5 parts of magnesium carbonate, distribute it through the mass by shaking, and put aside for at least four weeks. Filter through paper strewn with magnesia or talc, to secure a perfectly limpid fluid. The quality may be improved by the addition of 200 more parts of alcohol carrying about one-fifth part of lemon oil.

2. Oil of bergamot, 130; oil of lemon, 260; oil of thyme, 15; oil of rosemary, 25; oil of lavender, 30; alcohol, deodorized, 23,000; distilled water, 27,000. Proceed as before.

To make a cologne of a decided odour of fresh flowers, leave out the oils of thyme, rosemary and lavender, and use in their place terpineol to get an odour of lilac, or hyacinthin for hyacinth.

Egg Shampoo. (*Amer. Drugg.*, **42**, 1.) The following formula yields a heavy, amber-coloured fluid of a peculiarly agreeable scent, which lathers freely in contact with water, and leaves the hair in a fine silky condition: Fresh eggs, No. 3; spirit of soap, N.F., ℥iss.; potassium carbonate, gr. clx.; ammonia water, ♏ clx.; rose oil, gtt. ij.; bergamot oil, gtt. ij.; geranium oil, gtt. i.; oil of bitter almond, gtt. i.; rose water, ℥xxvij.

The eggs are first whipped thoroughly in an egg beater and then diluted with the rose water, gradually added. Next add the ammonia water, potassium carbonate and spirit of soap combined in one mixture, and after the whole has been thoroughly incorporated add the perfume oils with constant stirring.

Erasive Powder. (*Nat. Drugg.*, **33**, 7, after *Pharm. Zeit.*) An excellent erasive powder consists of equal parts of alum, sulphur, amber and saltpetre. In use, it is only necessary to scatter some of the powder on the fresh ink spot or writing that it is desired to erase, and rub off with a bit of clean blotter or a clean rag. The ink vanishes completely.

Face Powder. (*Spatula*, **9**, 87.) French chalk, 2 ozs.; rice flour, 2 ozs.; zinc oxide, 1 oz.; bergamot oil, 15 ♏; ylang-ylang oil, 10 ♏; neroli oil, 10 ♏. Mix.

Flours and Starches, Certain Foreign, Employed as Foods. Balland. (*Journ. Pharm. Chim.*, [6], **17**, 476.)

Apé. The flour known in Tahiti as "apé" is obtained from the rhizomes of *Arum macrorhizum*, which is widely distributed in Oceania. It is cultivated in most places like the yam, *Arum esculentum*, the tubercles of which are much appreciated in the tropics, and are known in Polynesia as "taro."

Conophallus, the flour of which is widely used in Japan, is derived from the tubercles of an Aroid, an *Amorphophallus*, which is closely related to the yam. Its tubercles may weigh as much as 3 or 4 kilos. On contact with water the flour forms a very sticky mass.

Tavolo, of Madagascar, is also the starch of the one, tubercles of a kind of yam, *Tacca pinnatifida*, with which the Malagasy make dampers.

Arrowroot is the highly prized starch of the rhizomes of *Maranta arundinacea*, which is widely cultivated in the tropics. In Tahiti and Réunion this starch is made into cakes which are used as food for infants.

Banana flour is prepared from the unripe fruit of *Musa sapientium.* The fruits are gathered while green, before the starch has been converted into sugar, and sliced transversely. These slices are dried in the sun, or by artificial heat, powdered, and sifted. This flour is extensively used in the tropics as a food, both in the form of porridge, damper, and cake. It has been introduced into Europe, but has not met with much appreciation.

Caryot, Sago, and Talipot. Caryot is the starch of the interior of the trunk of the Caryot (or Toddy) palm, *Caryota urens.* The product is an inferior sago, the best kind of which is derived from *Sagus rumphii.* Talipot is obtained from another palm, *Corypha umbraculifera.* The tree is cut down, the sap allowed to run away, the bark removed, and the inner portion of the trunk suspended in water and strained, to remove the coarser particles and woody fibre. The strained liquor deposits the starch, which is known in Ceylon as "Raw Palmira root flour."

Mapé is obtained from Tahiti in the form of a coarse white powder. It is obtained from the fruit of *Inocarpus edulis.* The ash of this starch contains manganese.

Nété is the flour derived from the fruit-pulp enveloping the seeds of *Parkia biglobosa*, a leguminous tree indigenous to French Guinea and other parts of tropical Africa.

Bread fruit flour, from the unripe fruit of *Artocarpus incisa*,

is an insipid non-saccharine substance, which forms, with fish and bananas, the stable food of the Tahitians.

The note is concluded with a table showing the proportions of moisture, albuminoids, fat, starch, cellulose, and ash in the flours enumerated above.

Fly Papers, Powders, and Applications. (*Pharm. Zeit.*, **47**, 645. See also *Year-Book*, **1901**, 224.) *Sticky Fly Papers.* (1) Resin, 150; linseed oil, 50; honey, 18. Melt together. (2) Rape oil, 70; resin, 30. Melt together. (3) Resin, 60; linseed oil, 38; yellow wax, 2. Melt together and strain. (4) Resin, 10, gum thus, 5; Rape oil, 5; honey, 1. Melt together. (5) An excellent sticky fly gum may be obtained as follows: Linseed oil is heated in an iron vessel until it takes fire; it is allowed to burn until a drop, being withdrawn, forms a thread. The fire is then extinguished. If the mass be too thick, it may be thinned down. To render it more attractive to flies, a little yellow wax may be added while hot. The burning should be performed in the open air. (6) Sesame oil, 5; dark resin, 11. Melt together. (7) Resin, 50; castor oil, 25; honey, 15; glycerin, 50. Melt together. (8) Canada balsam, 40; resin, 15; linseed oil, 20; castor oil, 20. Honey or anise oil may be added. To kill the flies quickly, the addition of a little quassia extract or cantharidin may be made.

Fly Powders. (1) Powdered long pepper, 5; powdered quassia, 5; powdered sugar, 10, are moistened with dilute alcohol, dried, and again powdered. The powder should be stored in a well-stoppered bottle; for use, a little is exposed sprinkled on a plate. (2) Powdered orris root, 4; starch powder, 15; eucalyptus oil, 1. The powder should be sprinkled on window sashes and sills, or wherever the flies congregate. (3) Eucalyptol, 5; French chalk, 10; starch powder, 85. This powder is for direct application, the face, head, or hands being rubbed with a little of it several times a day.

Fly Essence. Eucalyptol, 10; bergamot oil, 3; acetic ether, 10; eau de Cologne, 50; alcohol 90 per cent., 100. The essence, mixed with water, may be sprinkled about the room. It may also be applied, undiluted, to the skin.

Fly Ointment. Hard paraffin, 50; liquid vaseline oil, 45, are melted together; and eucalyptol, 4; anise oil, 1, added. The ointment is to be rubbed on the exposed parts of the body daily.

Fragrant Essence for the Sick-room. (*Journ. Pharm. Chim.*

[6], **16**, 560.) Eucalyptol, 10; thyme oil, 5; lemon oil, 5; lavender oil, 5; alcohol 90 per cent., 100. Mix a teaspoonful with a pint of water, and vaporize in the chamber.

Freckle Remover. (*Southern Drugg. Journ.*, **1**, 183.) Mercuric chloride, 7 grs.; hydrochloric acid, 2 drs.; sweet almonds, 1 oz.; glycerin, 6 drs.; simple tincture of benzoin, 30 mms.; bitter almond water, q.s. to make 8 fl. ozs. Blanch the almonds and make them, into a paste with the glycerin, to which add 6 ozs. of the bitter almond water. Add the tincture of benzoin with constant stirring, then the acid, and lastly the mercuric chloride, previously dissolved in 2 ozs. of the water.

Furniture Polish. (*Oesterr. Farb. und Lack. Zeit.*, after *Nat. Drugg.*, **32**, 331.) White wax, 100; water, 180; potassium carbonate, 1; oil of turpentine, 160. Boil the wax in a tared vessel in 60 parts of the water in which the potassium carbonate has been dissolved, make up the weight of the water lost by evaporation; stir until cold and then add gradually the turpentine, stirring until a perfect emulsion results. Then add at once, with constant stirring, the rest of the water, i.e. 120 parts. If the emulsion be not perfect, add a little more turpentine oil. To use the cream, smear a little of it on a thin soft rag, go over the part to be polished and polish with a flannel or woollen cloth. This cream answers equally well for leather, upholstery, imitation leather or marble.

Glove Cleaning Powder. (*Amer. Drugg.*, **42**, 127.) Prepared chalk, 3; powdered quillaia bark, 5; powdered cream of tartar, 15. Mix. To be applied with a damp sponge; then allowed to dry on, and brushed off when dry.

Glycerin Jelly. (*Amer. Drugg.*, **41**, 364.) Pulv. tragacanth. ʒij.: ol. rosæ geran., ♏xv.; alcohol, ℥iss.; glycerini, ℥iij.; aquæ, ℥vj.

Dissolve the oil in the alcohol and add to the tragacanth in a mortar; mix well. Then add, all at once, the glycerin and water, previously mixed. Stir until uniform and pour into pots.

Gonococcus, Stain for. A. von Wahl. (*Centr. für Bakter.*, through *Pharm. Centr.*, **44**, 97.) Saturated alcoholic solution of auramine, 4; alcohol 95 per cent., 3; saturated alcoholic solution of thionin, 4; saturated aqueous solution of methyl green, 6; water, 12. The saturated solutions of each of the above ingredients are prepared by dissolving in the warm liquid, allowing to cool,

and filtering. The gonococci are coloured deep violet on a background of bright green. Most other bacteria which are likely to be present are either not stained at all, or only very slightly.

Hair Preparations, Unna's. (*Western Drugg.*, **25**, 121.) *Borochloroform-alcohol.* Boric acid, 1; chloroform, 5; alcohol 90 per cent., 100 parts by weight.

Sublimate Vinegar. Acetic acid, 1; solution of mercuric chloride (1 : 1000), 100 parts.

Ichthyol-salicylic Soap. Ichthyol, 10; salicylic acid, 5; salve soap, 85.

Iodo-sublimate Solution. Corrosive sublimate, 1; glycerin, 10; tincture of iodine (1 : 10), 90.

Croton Oil Pencils. Croton oil, 10; wool fat, 5; yellow wax, 5.

Compound Chrysarobin Ointment. Chrysarobin, 5; ichthyol, 5; salicylic acid, 2; wool fat, 30; vaseline, 58. Mix.

Hair Stimulant. (*Bull. gén de Thérapeut.*, **144**, 560.) Quinine hydrochloride, 40; tannin, 100; alcohol 60 per cent., 8,800; tincture of cantharides, 100; glycerin, 600; Eau de Cologne, 400; vanillin, 1; powdered sandalwood, 5 parts. Mix and allow to macerate for 4 or 5 days, then filter. To be rubbed into the scalp every alternate day.

Hair Wash. H. Kuehl. (*Pharm. Zeit.*, **47**, 943.) The following is strongly recommended as an efficacious stimulant wash for promoting the growth of the hair. Rub down in a mortar, quinine hydrochloride, 6 grs., with menthol, 15 grs. Dissolve the mixture in 200 ♏ of alcohol. Dissolve resorcin, 30 grs., in a mixture of camphorated spirit, 300 grs., spirit of soap, 545 grs., and alcohol 68 per cent., 540 grs. Mix the two solutions, which may then be perfumed as desired, and filtered after standing for a few days to allow a slight deposit of soap to separate. A little of the preparation, diluted with 2 parts of lukewarm water should be well rubbed into the scalp in the morning; the hair should afterwards be well brushed and oiled with a little olive oil.

Harness Preparations. (*Bull. of Pharm.*, **16**, 481.) *Harness Oil.* Oil of turpentine, 32; beeswax, 4; Prussian blue, 2; lamp-black, 1. Melt the wax and turpentine together; add the powders and thin down with neatsfoot oil.

Harness Polish. Mutton suet, 2; beeswax, 6; sugar, 6; soft soap, 2; lamp-black, 1; oil of turpentine, 4; water, 4.

Melt the suet and beeswax in the turps, incorporate the lamp-black; dissolve the sugar and soap in the water; mix and stir until cold.

Harness Blacking. Soft soap, 12; isinglass, 3; Prussian blue, 1; transparent glue, 8; logwood, 8; vinegar, 96; lamp-black, q.s. Simmer together over a gentle heat and strain.

Horse flies, Protective Applications Against. (*Pharm. Zeit.*, **47**, 645.) 1. Oil of bayberries, 1,000; powdered naphthalin, 200; animal oil, 70; oil of amber, 15.

2 A decoction of, laurel leaves, 100; rosemary leaves, 20, in water, 500, is applied, diluted, to the parts of the horse liable to the attacks of flies.

3. Crude naphthalin, 10, is dissolved in warm methylated spirit, 60; bayberry oil, 5, and ether, 10, are then added.

4. Bayberry oil, 100; acetic ether, 200; naphthalin, 200; clove oil, 10; animal oil, 10. Mix.

5. Animal oil, 1; methylated spirit, 2; vinegar, 50. (See *Year-Book*, **1902**, 294.)

Hydrogen Peroxide, Cosmetic Cream. H. Kuehl. (*Apoth. Zeit.*, **22**, 705.) Lanolin is saturated with hydrogen peroxide until a soft, smooth, white cream is obtained. This forms an excellent application for rough, red skin, softening and bleaching the abraded surfaces. If desired, a mixture of equal parts of zinc ointment and lanolin may be substituted for the latter alone.

Hydrogen Peroxide in Glycerin and Rosewater. H. Kuehl. (*Apoth. Zeit.*, **22**, 705.) The popular glycerin and rosewater employed as a remedy for chapped hands, may be much improved by the addition of hydrogen peroxide, the addition tending to give a white, soft texture, as well as increasing the healing properties of the application. A useful formula is: Glycerin, 2; rosewater, 2; hydrogen, 1; parts by weight.

Hydrogen Peroxide Tooth Paste. H. Kuehl. (*Apoth. Zeit.*, **22**, 705.) The value of hydrogen peroxide in the care of the teeth lies principally in its bleaching power and its capacity of destroying germs. Many dentists use it in cleaning the teeth. It gives a shiny whiteness to the enamel, and dissolves the products of decomposition that blacken the teeth. Very good tooth pastes may be prepared by mixing hydrogen peroxide with powdered soap and chalk. A formula of this kind that works well is: Calcium carbonate, 5; medicated soap, 1; glycerin, hydrogen peroxide, of each a sufficient quantity to make a

paste; perfume with oil of peppermint and oil of lavender, of each a sufficient quantity.

Influence of Salts on the Amount of Acids Formed in Plants. E. Charabot and A. Hébert. (*Comptes rend.*, **136**, 1009.) From experiments with peppermint the authors conclude that, generally speaking, the addition of mineral salts to the soil in which the plants are grown increases the amount of volatile acids in the fresh leaves. But this increase is partially due to the fact that such plants contain less moisture. The difference is less marked when the amount of acid is calculated on the dry leaves. While chlorides and sulphates cause a slight augmentation, disodic phosphate brings about a more marked increase; nitrates appear to reduce the amount of acid. The proportion of free acids and of those occurring as esters is about the same. It is found, also, that when vegetative growth commences, the ash of the aerial portions is more alkaline than that of the roots, but that as the plant develops, the alkalinity of the ash of aerial organs decreases while it increases in the roots, until finally there is a preponderance in the latter. Salts added to the soil generally increase the combined acids in the aerial plant. On the root contents they appear to exercise no very marked influence. (See also *Year-Book*, **1902**, 120.)

Ink for Writing on Celluloid. (*Rev. Med. Pharm.*, **10**, 727.) Tannin, 15; dry ferric chloride, 10; acetone, 100. Dissolve the tannin and ferric chloride separately, each in acetone, 50. Mix the solutions.

Ink for Zinc Labels. (*Nat. Drugg.*, **32**, 277, after *Helfenberger Annalen.*) Potassium chloride, 60; copper sulphate, 120; aniline blue, 1; dilute acetic acid, 100; distilled water, 1,800. Dissolve the potassium chloride and the copper sulphate in 1,400 parts of water. Mix the acid in the rest of the water and dissolve the blue in the mixture. Mix the two solutions.

Ink Marks, to Remove. (*Deutsch. Amer. Apoth. Zeit.*, **23**, 19.) (1) Citric acid, 1; saturated solution of borax, 2; water, 10. (2) Calcium chloride, 3; saturated solution of borax, 2; water, 16. The writing or ink-stain is painted over with solution No. 1 with a fine brush, excess of the liquid removed by means of blotting-paper, and the spot brushed over with solution No. 2 with a fresh brush. Another method consists in treating in a similar way with the following solutions: (1) Potassium

chloride, 1; potassium hypochlorite, 1; water, 3. (2) Hydrochloric acid, 1; sodium chloride, 1; water, 3. The application of solution No. 1 must be allowed to dry on before applying solution No. 2. Either the above methods are available for removing ink-stains from textile fabrics.

Iodoform, to Remove the Odour of. F. Lafforge. (*Bull. gén. de Thérapeut.*, **145**, 115.) A little orange flower water rubbed well over the hands, after washing them in the ordinary way, with soap and water, will remove the odour of iodoform completely.

Indelible Inks. (*Spatula*, **9**, 86.) (1) Copper hydroxide, 3; solution of ammonia, q.s.; water, 12. Make a solution and add dextrin 1. Mix. (2) Silver nitrate, 50 grs.; solution of ammonia, 4 drs.; tartaric acid, 40 grs.; carmine, 5 grs.; mucilage acacia, 4 drs. Mix in the order written.

Ixora Essence. (*Augsburg. Seif. Zeit.*, through *Nat. Drugg.*, **33**, 165.) Turanol, 10; bergamot oil, 20; terpineol, 5; geranium oil, 5; iris oil, 2; tincture of tolu, 30; alcohol, deodorized, 500 parts. Mix.

Ixora Powder. (*Augsburg. Seif. Zeit.*, through *Nat. Drugg.*, **33**, 165.) Turanol, 20; patchouli oil, 5; oil of rose (artificial), 15; oil of neroli, 10; oil of bergamot, 30; talcum, 1,000; wheat flour, 2,000; rice flour, 2,000 parts. Mix.

Kid Glove Cleaner. (*Amer. Drugg.*, **42**, 100.) White soap, 250; water, 155; dissolve with heat, cool, and add javelle water, 165; ammonia water, 10. Mix to form a smooth paste. A little of this is rubbed over the glove with a piece of flannel.

Leather Varnish, Brilliant Deep-black. (*Nat. Drugg.*, **33**, 102.) The *Augsburg. Seif. Zeit.* is authority for the following: Manila copal, ground, 30; sandarac, ground, 19; Venice turpentine, 5; castor oil, commercial, 5; nigrosin, alcohol soluble, 6; alcohol (methylated), 90 per cent., 450 parts.

Dissolve the sandarac and copal in 125 parts of the alcohol Heat the Venice turpentine and castor oil together in a pot, and stir until a homogeneous mixture is obtained, then add to the alcoholic solution of resins and stir well together. Warm the remaining alcohol in a water-bath to about 30°C. (86°F.) and in it dissolve the nigrosin. Strain the varnish through linen, add the solution of nigrosin and stir until homogeneous. Set aside for 2 weeks, and then carefully draw off into bottles or tins.

Lemon Flavour. W. L. Scoville (*Bull. of Pharm.*, through *Chem. and Drugg.*, **61,** 357) gives the following formulæ for lemon flavourings in which citral is employed. 1 oz. of citral will replace 1 lb. of oil of lemon, as far as fulness but not delicacy of flavour is concerned :—

1. Yellow peel of 15 lemons grated; concentrated oil of lemon, 2½ drs.; alcohol, 4 pints; water, 4 pints. Macerate 24 hours and express. If necessary, filter through magnesium carbonate.

2. Yellow peel of 15 lemons; citral, 2 drs.; oil of lemon, 2 ozs.; alcohol, 4 pints; water, 4 pints. Treat as above.

3. Concentrated oil of lemon, 24 mms.; citral, 36 mms.; oil of lemon, 4 ozs.; tincture of turmeric, 4 ozs.; alcohol, 3 pints; water, 5 pints; magnesium carbonate, 2 ozs. Shake together occasionally during 24 hours and filter, returning the first portions to the filter until the liquid comes through clear.

Lepidopterous Larvæ, Digestive Enzymes of. S. Sawamura (*Chem. Centr.*) has examined the enzymes in the extract of the so-called stomach and intestines of larvæ of *Dasychira lumulata* and of *Caligula japonica.* The digestive ferments are active only in alkaline solutions, and are inactive in acid media. Ferments analogous to trypsin, diastase and lipase were detected. The proteolytic enzyme converts albumin into peptone, which, however, is not further converted into leucin and tyrosin. The amylolytic enzyme renders starches fluid and converts them into dextrin and maltose. The lipase liberates the fatty acids from animal fats. In the intestines proper only the proleolytic enzyme was found. Although the wider portion of the intestinal canal of lepidopterous larvæ is usually regarded as the stomach, it would appear in its functions rather to approach the intestine of vertebrates. It would appear that, as far as the lepidoptera are concerned, the theory that invertebrates possess no organ analogous to the vertebrate stomach, secreting an acid secretion rich in proteolytic enzymes, is correct.

Milk of Glycerin. (*Pharm. Zeit.*, **47,** 868.) Intimately mix glycerin, 115, and starch, 8; heat together until the starch granules are all burst and a clear jelly is formed; remove from the heat, add another 8 parts of starch, and rub down with water, 40. When cold, add simple tincture of benzoin, 2, and perfume as required.

Milk of Roses and Elder. (*Southern Drugg. Journ.*, **1,** 184.) Spermaceti, 24 grs.; powdered white soap, 90 grs.; almonds,

4 ozs.; white wax, 90 grs.; almond oil, 90 grs.; alcohol 90 per cent., 4 ozs.; water, 1 pint; otto of rose, 5 drops; oil of neroli, 10 drops; essence of jasmin, 1 dr.; essence of white rose, 1 dr. Blanch the almonds, beat them to a smooth paste, gradually adding water to form a thin cream. Melt the spermaceti and almond oil together, add this to the soap previously rubbed down with 4 drs. of water. Dissolve the perfumes in the alcohol and mix all together.

Milk Powder. (*Rev. Med. Pharm.*, **9**, 555.) Sodium bicarbonate, 1; milk, 500. Evaporate down to three-fourths its volume and gradually add, with constant stirring, powdered sugar, 250. Spread the mass out on plates, dry, powder, and store in stoppered vessels. For use, dissolve 6 parts of the powder in 100 of water.

Nail Polishing Powder. (*Deutsch. Amer. Apoth. Zeit.*, **23**, 61.) Stannic oxide, 1,000; powdered orris root, 100; French chalk, 300; rice starch, 100; carmine, 8–10; otto of rose, 3; lignaloe oil, 15; geranium oil, 20.

Odol Dentifrice. (*Amer. Drugg.*, **42**, 100.) Salol, 40 Gm.; saccharin, 0·4 Gm.; thyme oil, 10 drops; peppermint oil, 300 Gm.; tincture of vanilla, 200 Gm.; alcohol, enough to make 1,000 Gm.

One-Solution Photographic Developer. (*Chem. and Drugg.*) Metol. (Hauff), 25 grs.; quinol, 40 grs.; potass. metasulph., 100 grs.; potass. brom., 8 grs.; potass. carb. 1 oz. 20 grs.; aq. dest. ad 10 fl. ozs.

Dissolve the metol and quinol in 6 ozs. of water, add the metasulphite and bromide, dissolve, and strain. Dissolve the salt of tartar in the rest of the water, and mix the two solutions.

Cork the bottles tightly, having previously dipped the corks in melted wax. The label reads thus: "Dilute with an equal part of water before use. For bromide papers use 2 parts of water for 1 part of developer. In cases of over-exposure add a few drops of 10 per cent. solution of potassium bromide, 10 per cent.

Orange Flower "Skin Food." (*Pharm. Era*, **28**, 526.) White wax, 1½ ozs.; spermaceti, ½ oz.; coco-nut oil, 1 oz.; lanoline, 1 oz.; oil of sweet almonds, 2 fl. ozs. Melt together in a porcelain dish and add orange flower water, 1 fl. oz.; simple tincture of benzoin, 3 drops. This is stated to be an excellent preparation for the skin, which may also be used in massage for removing wrinkles.

Pack Thread, Strong. (*Nat. Drugg.*, **33**, 39, after *Pharm. Centr.*) An extraordinarily strong pack thread or cord may be obtained by laying the thread or fibres in a strong solution of alum, and then carefully drying them. Threads thus prepared are practically unbreakable.

Perfume Tablets. (*Nat. Drugg.*, **33**, 9, after *Seifensieder Zeit.*) Perfume tablets consist of a compressed mixture of rice starch, magnesium carbonate and powdered orris root, saturated with heliotrope, violet essence, etc., as follows:

Violet Tablets. Ionone, 50; ylang-ylang oil, 50; tincture of musk, strongest, 200; simple tincture of benzoin, 200 parts. Mix.

Heliotrope. Heliotropin, 200; vanillin, 50; tincture of musk, 100; simple tincture of benzoin, 200 parts. Mix.

Lilac. Terpineol, 200; lily of the valley essence, 200; tincture of musk, 200; simple tincture of benzoin, 200 parts. Mix.

Phenosalyl. J. Cambe (*Bull. Pharm. du Sud-Est*, **7**, 246) suggests the following formula for phenosalyl: Phenol, 600; lactic acid, 50; salicylic acid, 50; borax, 80; menthol, 1; thymol, 1; eucalyptol, 1; glycerin, 200. Dissolve the borax in the glycerin by the aid of heat. Add to it, while warm, the salicylic acid, phenol, and lactic acid, when a solution is obtained; cool and add the volatile ingredients.

Phenotozone. (*Bull. Comm.*, **31**, 228.) This is a mixture of acid acetic, 52; phenol, 2; menthol, 2; camphor, 2; eucalyptus oil, 2; lavender oil, 1. It is, in fact, an aromatic vinegar, and is recommended as an antiseptic inhalant for coryza.

Precipitates, Apparatus for the Automatic Washing of. Kaplan. (*Annales de Pharm.*, **8**, 492.) Two flasks of equal capacity, A and B, are taken, A being fitted with a side tubulure, E, just below the neck and carrying a funnel fitted to a cork in the mouth of the flask. B contains the washing menstruum and is fitted with a 2-hole cork, pierced by 2 bent glass tubes, one short, C, the other long, D, similar to those employed in the ordinary wash bottle. The flask B is placed on a higher level than A, and the short tube, C, connected with the tubulure E by means of rubber tubing. The long tube, D, is also fitted with a rubber tube, F, to which is attached a glass delivery tube, G, so arranged that the menstruum may be syphoned over on to the precipitate contained on a filter in the funnel. The filter is fitted closely to the sides of the funnel

so that no air can pass into the interior of the flask A between the paper and the glass. The precipitate being thrown on the filter, the latter is filled with water to the level at which it is desired to maintain the liquid. The rubber tube is momentarily detached from E and a stream of water delivered from B by blowing up it through C. As soon as the syphon is started, the rubber tubing is re-fitted to E, when an equilibrium of pressure will be maintained, only so much liquid being delivered through the syphon D, F, G, as is equivalent to the amount that passes through the funnel. Until this flow is uniform the stream of liquid may be diverted from the funnel, to be readjusted as soon as a steady flow is established. In this manner precipitates which are difficult to wash may be dealt with in a relatively short time.

Preservation of Books in the Tropics. (*Agric. News*, **1**, 140.) To prevent the destruction of books by tropical insects such as cockroaches and other pests which often do great damage, the covers both inside and outside should be painted over with the following mixture: Corrosive sublimate, 1 oz.; carbolic acid, 1 oz.; methylated or spirit rum, 2 pints. Books should be repainted with it every two or three years.

Preservative Solution for Museum Specimens. (*Pharm. Centr.*, **44**, 161.) Formalin, 60; glycerin, 120; alcohol (methylated unmineralized), 30; water, 1,000 parts by weight. The addition of glycerin is only necessary when the preparation is required to keep soft. Thick specimens, such as preparations of lung or liver, should be incised, so as to facilitate the penetration of the preservative. For very thick specimens the amount of formalin may be increased to 80 or 100 parts.

Quinine Hair Wash. (*Amer. Drugg.*, **42**, 100.) Quinine sulphate, 1; glycerin, 30; Cologne water, 60; bay rum, 60; rose water, 330.

Removing Stoppers. (*Chem. and Drugg.*, **61**, 555.) According to the *Druggists' Circular*, if a mixture of alcohol, 2 parts glycerin, 1 part, and salt, 1 part, is placed in the space round the tight stopper, the stopper can be removed after standing a few hours. This is given as the result of thirty years' experience.

Rubber Cements. (*Neueste Erfind. und Erfahr.*, through *Pharm. Centr.*, **44**, 181.) *Marine Glue.* Good African rubber 10, is dissolved in benzol, 10, with constant agitation, and then added to asphalt, 20, previously melted. For use, it is melted by standing in hot water, or on a water-bath.

Bicycle Cement. Melt rubber, 2, and add asphalt, 18. The elasticity is increased by adding resin oil or tar oil, 1 part.

Rubber Glue, for woodwork exposed to damp, is simply a solution of rubber in CS_2, saturated with sulphur.

Rubber Cement. Melt together rubber, 15, wax or tallow, 1; add sufficient slaked lime to produce a thick mass, then add red lead, 2 parts.

Cement for Glass Ware is a solution of rubber in $CHCl_3$, with or without the addition of mastic.

Rubber Cements for Leather are solutions of rubber in chloroform, benzol, benzin, carbon disulphide, or other volatile solvent, or rubber melted with pitch, tar, or asphalt.

Acid-proof Rubber Cement. Rubber, 10, is dissolved in linseed oil, 10, and clay, 30, is then added. Or clay, 15, is added to a solution of rubber, 5, in benzol, 10.

Saccharin, Synonyms of. (*Nat. Drugg.*, **33**, 7.) In Mentzel's *Verzeichniss neuer Arzneimittel* the following are given as synonyms of saccharin: Agucarine, benzoic sulfinid, garantose, glucosimide, glusidum, glycophenol, glycosine (also glykosin), saccharinol, saccharinose, saccharol, saccharum artificiale, saxin, sucre de houille (coal-tar sugar), süsstoff-Monnet, süsstoff-Sandoz, sulfinidum absolutum, sykose, toluolsüss, zuckerin.

Sanatol. G. Fendler. (*Journ. Pharm. Chim.* [6], **16**, 35, after *Pharm. Zeit.*) Under this name a sulphonated mixture of phenols has acquired a considerable reputation as an efficient disinfectant. A similar product may be obtained by heating heavy coal tar oil, 2, with sulphuric acid 90 per cent., 3, and diluting the product with sufficient water to bring the weight to 10 parts. It is a brown liquid with the odour of phenol and sulphurous acid. It gives an almost clear solution with water, which throws down a slight deposit on standing. It may be used, with advantage, to substitute creolin, lysol, sapocarbol, and similar preparations.

Sapoform. (*Nat. Drugg.*, **33**, 98.) This is the name of a liquid formalin soap that is made as follows: Oleic acid, 100; alcohol (methylated), 95 per cent., 60; potassium hydrate, 20; water, 60; formaldehyde 40 per cent., 250. Mix the oleic acid and alcohol; dissolve the potash in the water, and add to the foregoing. Shake vigorously, and set aside for from 12 to 24 hours, then add the formaldehyde and mix by agitation. The product is a limpid liquid of the colour of sherry, which makes a clear mixture with water and alcohol.

Sea-Foam, or Dry Shampoo. (*Canad. Drugg.*, **14**, 302.) (1) Coco-nut oil soap, 2 ozs.; potassium carbonate, 1 oz.; alcohol 90 per cent., 16 fl. ozs.; bay oil, 30 ♏; tincture of turmeric, 30 ♏; water to produce 32 ozs. Dissolve the soap in a little water by the aid of heat. Add the potassium carbonate, and more water to make up 16 fl. ozs. When nearly cold, add the spirit in which the oils have been previously dissolved. Filter. (2) Castor oil, 4 fl. drs.; solution of ammonia, 4 fl. drs.; ammonium carbonate, 4 drs.; alcohol 90 per cent., 16 fl. ozs. Water to produce 32 fl. ozs. Dissolve the oil in the alcohol, add the liquid ammonia, then the ammonium carbonate dissolved in the water. It may be perfumed with bay oil or other perfume, and tinted with turmeric as in formula No. 1.

Seeds of Plants of Medicinal and Toxicological Interest. E. M. Holmes. (*Pharm. Journ.* [4], **16**, 5.) The note treats of the distinctive characters of the seeds or seed-like fruits of the commoner poisonous plants, and such as are often eaten by children. It is not unfrequent that identification of these seeds, as passed in the evacuations of the patient, is required by the medical attendant. To assist this identification, the seeds of the following plants, some of which are poisonous, others of frequent occurrence in evacuations, are described and drawn: *Tamus communis; Bryonia dioica; Solanum dulcamara; Atropa belladonna; Ligustum vulgare; Arum maculatum; Hedera helix; Daphne mezereum; Rubus fruticosus; Fragaria elatior; Ribes grossularia; Sambucus niger.*

Shaving Cream. (*Neueste Erfind. und Erfahr.*, **29**, 3.) Lard, 10; olive oil (or sesame oil), 8; coco-nut fat, 7, are melted together at about 35°C. To the melted fats 12·5 parts of a 4 per cent. solution of caustic potash is added in a thin stream with constant stirring, then 1·5 parts of a 15 per cent. solution of pearl-ash, the stirring being vigorously maintained until complete saponification is brought about, and the mass acquires the consistence of a thick cream. This is then suitably perfumed, as, for instance, with a mixture of thyme, lavender, citronella, and spike oils, and filled into collapsible tubes.

Silver, to Oxidize. (*Nat. Drugg.*, **33**, 39.) The "oxidation" of silver is a very simple operation, yet there is some little skill necessarily involved in putting a handsome black finish on the object, after treatment. The *Journ. der Goldschmied.* gives the following directions, by following which very fine effects

may always be obtained: Into a cup of hot water put about 10 grs. of liver of sulphur (potassium sulphide) and mix well. Into this plunge the object to be coloured, after first making it as white as possible with the scratch brush, and let it remain there for about 2 minutes. Take it out, then rinse it with clear water, use the scratch brush on it again, and return it to the still warm bath. Let remain for a similar length of time, then repeat the operation of scratching off and returning to the bath. A third immersion is usually sufficient to produce a wonderfully fine black "oxidation."

Silvering Powder for Copper. (*Amer. Drugg.*) Copper vessels and reflectors may be rapidly silvered by well rubbing with the following powder: Potassium cyanide, 2; silver nitrate, 1; prepared chalk, 6. All the ingredients to be in fine powder. After a good surface of silver is produced, it is rinsed with water, dried and polished. [Iron and some other metals should be coated with copper first by applying solution of $CuSO_4$, before silvering. This answers well for small articles.—ED. *Year-Book.*]

Snake Venoms, the Specific Nature of. Tidswell. (*Austral. Med. Gaz.*, through *Brit. Med. Journ.* [2], **1902,** 1918.) The claim of Calmette that his antivenomous serum, prepared from animals treated with cobra virus, ensures immunity to animals bitten by poisonous reptiles of other species, is controverted. The author finds that Calmette's serum is inoperative against the poison of Australian snakes. Among Australian snakes, too, the author found that the antivenomous serum obtained from one species of snake is useless against the poison of another. Thus although tiger-snake serum was brought to such potency that 0·04 c.c. would counteract 0·00005 Gm. of venom, it showed no appreciable action against the poison of brown and black snakes, or of the death adder.

Sodium Thiosulphate in Dental Caries. Claret. (*Bull. gén. de Thérapeut.*, **145,** 214.) A plug of absorbent cotton wool, saturated with a solution of sodium thiosulphate, introduced daily into the fetid cavity of a decayed tooth and covered with a piece of dry wool, is found to be a most efficient deodorant. The application is repeated daily for a few days, when all putrid odour and unpleasant taste will be removed. This treatment has succeeded perfectly even where the application of phenol has been followed by no appreciable benefit.

Spider Bites, Toxicity of. R. Kobert. (*Pharm. Centr.*, **43,**

359.) It having been disputed that the bites of the common spiders of Northern Europe have any toxic effect on mammals, the author has experimented with *Epeira diadema*, the common garden spider, and finds that the juice of the entire crustacean is highly toxic, 1 Mgm. administered to a cat being sufficient to cause death. He infers that the special secretion of the poison gland, if it could be collected in sufficient quantity for experiment, would prove even more toxic. It appears, like snake venom, to be a soluble albuminoid. Sachs, by macerating Epeiras in toluol water containing 10 per cent. of salt, has been able to isolate a very active hæmolysin which causes the disintegration of the red blood corpuscles, both of man and other animals, at normal temperatures. Kobert also found that the direct bite of *Chiracanthium nutrix* is poisonous, being followed by a rigor, and the wound ultimately suppurating; this species is not a true native of Germany, but is an introduced exotic.

Toning and Fixing Photographic Bath. (*Chem. and Drugg.*, **62**, 727.) Sodii hyposulph., ℥j. ʒvj.; plumbi acet., gr. xx.; aurii chlorid., gr. iiss.; aqua destill. ad ℥x.

Dissolve the hypo and sugar of lead in the water, set aside for two days, filter, and then add the gold chloride. Label as follows: "Prints should be rather deeper than required when finished. Immerse the prints in the solution for from 10 to 15 minutes until the desired tone is obtained, and finally wash for an hour in running water.

Tubercle Bacillus in Sputum, New Method of Separating. H. Couratte Arnaude. (*Annales de Chim. Analyt.*, **8**, 66.) 10 c.c. of the sputum is mixed with 100 c.c. of water and 10 drops of caustic soda solution; the mixture is boiled, with stirring, until it becomes homogeneous; 20 c.c. is then withdrawn, cooled and treated with 4 drops of acetic acid and 4 c.c. of ether. On shaking up, a precipitate is formed which rapidly collects, on standing, on the upper surface. This is collected, re-dissolved in soda and shaken up with an excess of ether. On standing, a ring is formed at the point of junction of the aqueous solution and the ether. It is here that almost all the bacilli will be found. The ether is allowed to evaporate on the surface of the liquid, until only just a pellicle is left, portions of which may then be removed, spread on cover glasses, and stained by any method. By this method tubercle bacilli may be detected where they have not been found by ordinary or direct methods.

Turah Sachet Powder. (*Seif. Zeit.*, through *Nat. Drugg.*, **33**, 165.) Turanol, 100; musk, artificial, 5; heliotropin, 30; vetiver oil, 10; simple tincture of benzoin, 100; yara-yara, 5; sandalwood in powder, 200; lavender flowers, powdered, 1,000; rose leaves, powdered, 1,000; orris root, powdered, 2,000 parts.

Urinary Deposits, Method of Mounting, for Microscopical Examination. L. N. Boston. (*Amer. Journ. Pharm.*, **75**, 111.) When the sediment is to be mounted as a permanent specimen, decant clear supernatant urine, and add an equal quantity of water in its stead, and again allow to subside, repeating the process until this sediment is thoroughly washed.

The sediment, however obtained, is lifted by means of a wide-mouthed pipette, and a small drop of it placed on the centre of a slide. The specimen is now viewed through a $\frac{2}{3}$ lens to determine its value; and should the subject be one worthy of preservation, the above method of washing having been employed, the specimen is allowed to dry in the air, after which it may be mounted in Canada balsam. This method will be found of service for inorganic sediments, pus, blood, bacteria, fungi, and the ova of animal parasites. Casts and animal parasites, however, while collected in the same manner, must be mounted while yet moist (since drying causes disintegration) in a special medium composed of the following: Liquor acidi arseniosi (U.S.P.), 1 fluid oz. [or liquor arsenici hydrochlor. (B.P.)]; salicylic acid, $\frac{1}{2}$ gr.; glycerin, 2 fl. ozs. Warm slightly until solution is effected, when add acacia (whole tears) and again warm until the solution is saturated. After subsidence, decant the clear supernatant liquid. The drop of mounting medium should always be of good size, since it requires a quantity for urinary sediments of twice that usually employed for sections. A perfect distribution of the sediment throughout the medium is accomplished by drawing a needle from the margin to the centre of the drop.

Staining. Place a small drop of the sediment on a slide and spread it over a large surface in order that the cells may be separated; heat over a flame for three minutes, carrying the slide to the ulnar surface of the hand every few seconds. A guide, in fixing by heat, is never to raise the temperature above that which can be borne by the surface of the hand, since a higher heat is liable to cause distortion of the cells. Staining is best effected by a solution of carbol-fuchsin, methylene blue, Soudan III and iodine. The former of these solutions when employed without heat will be found to stain satisfactorily both bacteria and the tissue cells.

When heat is applied and the specimen steamed, and later counter-stained for 3 minutes with Gabbett's blue solution, tubercle bacilli will appear as bright-red segmented rods, while other pathogenic organisms will appear blue. The various fungi (mycelium) found in urinary sediments are of limited clinical value. Soudan III and iodine are of service in the detection of fatty and amyloid changes respectively. Spermatozoa, when stained, provide an interesting subject.

Vanillin Essences. (*Canad. Pharm. Journ.*, **36**, 324.) No. 1: Vanillin, 100 grs.; glycerin, 2 fl. ozs.; alcohol 60 per cent., to make 16 fl. ozs. Caramel to colour. No. 2: Vanillin, 100 grs.; alcohol 90 per cent., 8 fl. ozs.; water, 5 fl. ozs.; syrup, 3 fl. ozs.; caramel, q.s. Some formulæ call for a stronger alcohol than either of the above, but 50 or 60 per cent. spirit is quite strong enough. Sometimes an essence with tonka or coumarin is preferred. No. 3: Vanillin, 80 grs.; coumarin, 25 grs.; glycerin, 1 fl. oz.; water, to 32 fl. ozs.; caramel, q.s. No. 4: Vanillin, 20 grs.; coumarin, 40 grs.; benzoic acid, 60 grs.; glycerin, 4 fl. ozs.; alcohol 90 per cent., 4 fl. ozs.; water, to 32 fl. ozs.; caramel, q.s. This is for a very cheap essence.

Violet Perfume for Powders. (*Spatula*, **9**, 87.) Bergamot oil, 30 ♏; sandal oil, 1 dr.; bitter almond oil, 4 drops; otto of roses, 8 drops; tincture of musk, 2 drs.; tincture of orris, 16 fl. ozs. Mix.

Violet Sachet Powder. (*Spatula*, **9**, 87.) Granulated orris root, 4 ozs.; sandalwood sawdust, 2 ozs; patchouli leaves, 1 oz.; lavender flowers, 1 oz.; ionone, 15 ♏; musk, 1 gr.; bergamot oil, 10 ♏; bitter orange oil, 5 ♏; rose oil, 2 ♏; coumarin, 4 grs. Mix.

Waterproof Paper. (*Apoth. Zeit.*, **22**, 350.) Paper for wrapping parcels may easily be rendered waterproof by dipping in a solution of acetic acid, or vinegar, 2·5; potassium bichromate, 3·5; water, 50. The bichromate is first dissolved, then the vinegar is added. The sheets are passed through a bath of this liquid, one by one, so as to be thorough and evenly moistened. They are then hung on a line and dried in the air.

Witch-Hazel Jelly. (*Southern Drugg. Journ.*, **1**, 184.) (1) Mucilage of Irish moss, 4 ozs.; witch-hazel water, 4 ozs.; glycerin, 6 ozs.; eau de Cologne, 5½ ozs.; borax, 30 grs. Dissolve the borax in the witch-hazel water, mix with 3 fl. ozs. of glycerin and the perfume; add slowly to the mucilage, previously mixed

with the remainder of the glycerin. Allow to stand for a few hours, then strain. (2) Powdered tragacanth, 160 grs.; glycerin, 5½ ozs.; water, 5¼ ozs.; witch-hazel water, 5¼ ozs. Rub the tragacanth to a smooth paste with the mixed liquids. Perfume as desired.

Wrinkle Remover. (*Pharm. Era.*, **28,** 526.) White petrolatum, 7 ozs.; hard paraffin, ½ oz.; lanoline, 2 ozs.; water, 3 fl. ozs.; otto of rose, 3 drops; vanillin, 2 grs.; alcohol 90 per cent., 1 fl. dr. Melt the paraffin, add the lanoline and petrolatum, and pour the melted mixture into a warm mortar; incorporate the water with constant stirring; when nearly cold add the perfumes. The preparation should be rubbed vigorously into the skin, as friction assists the absorbed fat in developing the muscles, and also imparts softness and fulness to the skin.

Yeast, Permanent Microscopical Preparation of. (*Nat. Drugg.*, **33,** 106.) Make a staining solution as follows: Crystallized hæmatoxylin, 35; absolute alcohol, 1,000 parts. Dissolve and add 250 parts of a solution containing 1 part of alum in 300 parts of water. Shake well and set aside, exposed to the light for three or four days, then filter. Into a suitable quantity of this solution place the cover-glasses in which the saccharomyces are fixed (by the usual process of passing through the flame of a lamp), floating face downward, and leave for 15 minutes, wash, let dry, and mount in balsam dissolved in xylol. The preparations will keep indefinitely.

RESEARCH LIST, 1903.

RESEARCH LIST, 1903.

The following subjects are suggested for investigation, and the Executive Committee hopes that members of the B.P.C. will undertake to work at one or more of these questions. New subjects have been added to the list to replace those worked out. The Hon. Secretaries wish to call attention to the fact that a special fund has been raised to defray expenses connected with research work. The Executive Committee will be glad to receive applications from members for grants from the above fund.

Plant Analysis.

1. *Arnica.* What is the active principle, and what are the relative proportions of it in the root and flower?

2. *Bay Berries.* An examination of the bitter principle of the pericarps of bay berries is required.

3. *Cascara Sagrada.* What is the nature of the various resins contained in the bark? The cascara sagrada of commerce apparently consists of two species, *R. purshiana* and *R. californica*, the latter having a much paler fracture. It is desirable to ascertain how far these differ in activity, percentage of active principles, yield of extract, etc. (See *Year-Book*, **1893**, 131; **1899**, 134.)

4. *Castor Oil.* A research having for its object the isolation of a purgative principle is required. (See *Year-Book*, **1898**, 163, 184; **1901**, 125. *Pharm. Journ.* [4], **5**, 84; **11**, 152.)

5. *Chamomile.* Research upon the bitter principle of *Anthemis nobilis.* (See *Bull. de Soc. Chim.* [2], **41**, 483.)

6. *Cimicifuga racemosa* (Actæa racemosa). Further information is needed on the chemical nature of the constituent or constituents to which the rhizome of the plant owes its activity. (See *Year-Book*, **1885**, 149.)

7. *Damiana* is reported to contain a bitter substance, resins, and volatile oil. The liquid extract of the leaves being ex-

tensively used, a thorough systematic examination of this drug is desirable.

8. *Determinations* of the total quantity of alkaloids in certain plants, such as belladonna, at *different stages of growth* would be useful.

9. *Euphorbia pilulifera.* Required, a report upon the chemistry of this drug.

10. *Fucus vesiculosus.* The medicinal virtues have been attributed solely to the presence of iodine and bromine. It is not improbable that it may contain some organic constituent of importance. A complete chemical investigation is required.

11. *Mezereon Bark.* What is the chemical nature of the acrid principle of this bark?

12. *Papaver rhœas.* An examination of the red colouring matter of the petals is required.

13. *Simarouba Bark.* A comparison of the constituents of this drug with those of quassia wood is desirable.

14. *Strophanthus.* Information is desirable on the best methods of separating the different active principles obtained from strophanthus seeds. (See *Year-Book*, **1898,** 54, 162; **1899,** 59; **1901,** 167; also *Pharm. Journ.* [4], **6,** 385, 506.)

15. *Taraxacum.* To what constituents are the cholagogue and diuretic properties due? To what extent do they vary in roots collected at different seasons of the year?

16. *Veratrine.* Should a pure veratrine be included in the British Pharmacopœia rather than the mixture of alkaloids now official? If so, suggest a process for its purification.

17. *Proximate Analyses* of the following drugs are required: *Cereus grandiflorus, Citrullus colocynthis, Cassia fistula* and *Serenoa serrulata* (Saw Palmetto).

CHEMISTRY.

18. *Adeps.* A satisfactory test for the presence of cotton seed oil is needed. A good test for lard oil is required.

19. *Apomorphine.* Do solutions of this alkaloid retain their potency after coloration has taken place?

20. *Cotton Wools.* How far do commercial samples conform to the tests of the British Pharmacopœia?

21. *Ferri Arsenas.* The official tests supply only the means of determining the amount of ferrous iron present. It has been suggested that a method for the determination of the arsenic content should be ordered. (See *Pharm. Journ.* [4], **7,** 530; *Year-Book,* **1903.)**

22. *Glycerin.* Required a good method for determining this substance, applicable if possible to pharmaceutical preparations.

23. *Ipecacuanha.* Experiments upon the method or methods for the separation of the alkaloids are needed.

24. *Sodium Arsenate.* A better method of assay than that now official would be welcome.

25. *Tannins.* The various methods employed for the estimation of tannin in astringent drugs and preparations give very discrepant results. Required, a thorough research into the comparative result of these processes.

PHARMACOPEDY AND PHARMACY.

26. *Botanical Sources* of the following require investigation. The varieties of asafetida and galbanum; the gum resin opoponax; the co-called Syrian tragacanth; the large liquorice root imported from Bussorah (probably *Glycyrrhiza echinata*), and the varieties of copaibas of commerce.

27. *Cannabis indica.* Preparations of uniform strength of this drug are needed. Experiments are required as to the best method of preparation. Experiments are also needed to determine the difference in yield of resin, cannabin, and cannabinol between the guaza of Bombay and the ganjah of Calcutta.

28. *Compressed Drugs and Coated Pills.* Required, a report on the strength and quality of the compressed drugs and coated pills of commerce.

29. *Effect of Cultivation, Soil, Climate, and Time of Collection on Medicinal Plants.* Compare the proportions of active constituents of indigenous plants grown in different districts, and the effect upon those constituents by variations in the time of collection.

30. *Ergot.* The determination of the proportion of active principles extracted from ergot by the official processes for the various preparations.

31. *Extractum Taraxaci Liquidum.* The specific gravity and proportion of solid residue appear to vary much in commercial specimens. To what is this variation due?

32. *Galenicals.* The action upon these of light and ordinary exposure in a pharmacy.

33. *Hamamelin.* Should this be prepared from the leaves or the bark? Experiments on the relative efficacy of powdered extractives from the two parts of the plant are desirable.

34. *Jaborandi.* The leaves as imported are much mixed with stalks. Should the leaves be completely separated from the stalks

for the making of official preparations? What is the alkaloidal strength of old leaves, young leaves, and stalks?

35. *Liquor Sennae Concentratus.* In this preparation the senna is exhausted by repercolation; in the liquor for preparing syrupus sennæ, B.P., a process of double maceration is employed. Which is the better method?

36. *Liquorice.* An examination of commercial samples of "Block Juice" and "Stick Liquorice," with reference to their purity and glycyrrhizin content would be of value.

37. *Olive Oil.* It has been suggested that for galenical preparations purified cotton seed oil, arachis oil, or sesame oil might be substituted for olive oil. A series of plasters, liniments, ointments, etc., should be prepared with each of those oils, and the resulting products compared.

38. *Oxydase.* The action of this and other ferments in inducing changes in galenical preparations such as liquid extracts, etc.

39. *Pepsin.* A good method of assay—determining the peptonizing and not merely dissolving power of pepsin, suitable for inclusion in B.P., is wanted. (See *Pharm. Journ.* [4], **5**, 561; also Mette's test in Schäfer's *Physiology.*)

40. *Powdered Drugs.* The determination of the limits within which adulteration of powdered drugs can be determined under the microscope.

41. *Suppositories.* A compilation or determination of the specific gravity of the medicaments more commonly prescribed in suppositories in order that correct allowance may be made for the volume of the same. (See *Pharm. Journ.* [4], **5**, 437; [4], **6**, 69.)

TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

FORTIETH ANNUAL MEETING

IN

BRISTOL,

1903.

CONTENTS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, a number of Vice-presidents not exceeding six, by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

**** Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

(Name)..

Address) ______________________________________

as a Member of the British Pharmaceutical Conference.

....*Member*

Date ______________________________

This or any similar form must be filled up legibly, and forwarded to *The Asst. Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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Boucher, J. M., Bristol.
Bush, J. E., Melksham.
Buxton, T., Bristol.
*Chandler, J., Bristol.
Chandler, R., Bristol.
Coles, J. C., Chippenham.
Collis, A. F., Bath.
Collis, J. T., Clifton.
Colley, A. J., Bristol.
Cooper, J., Weston-super-mare.
Cox, A. W., Bristol.
Davies, J. T., Bristol.
Dibble, J. W., Bristol.
Durant, J., Bristol.
Evans, J., Bath.
Ellis, F. R., Bishopston.
Freestone, R. H., Bristol.
Frowd, E. F., Portishead.
Gadd, H., Bristol.
Gadd, H. W., Bristol.
*Good, J. T., Bristol.
Grant, D., Fishponds.
Grant, T., Clifton.
Green, E. C. F., Frome.
Griffiths, J. S., Redland.
Harris, E. T. P., Bristol.
*Hill, E. W., Bristol.
Hodder, G. W., Frome.
Isaac, G. W., Clifton.
Isaac, H. O., Clifton.
John, B., Bath.
Jones, R., Chipping Sodbury.
Keen, B., Bristol.
Kevill, A. G., Bristol.
Kenderdine, A.G., Clifton.
Kenway, Miss B. A., Clifton.
Light, J. H., Bristol.
Llewellyn, D., Bristol.
Long, J. T., Bristol.
Loveless, E. W., Bath.
Maish, E., Cotham.
*Matthews, H. E. (*Hon. Treasurer*), Clifton.
Moore, F. S., Bath.
Nethercott, W. J., Bristol.
Newman, R., Cotham.
Norton, C. B. S., Bishopston.
Olds, J. C., Bath.
Osborne, G., Bruton.
Palmer, J. S., Thornbury.
Partridge, C. H., Bishopston.
Pitman, J., Bristol.
Pitchford, W., Cotham.
*Plumley, J. G., Bristol.
Plumley, H. J., Bristol.
Presley, E., Bristol.
Sleight, F., Clifton.
Smallman, F. R., Brislington.
Stokes, C. A., Fishponds.
Stroud, J., Bristol.
*Taylor, A. L., Bristol.
Thomas, J. D. D., Bristol.
Townsend, C., Bristol.
Townsend, H. H., Bristol.
Trebilco, A. J., Bristol.
Trew, H. E., Bristol.
*Turner, G. T. (*Vice-President*), Clifton.
Turner, J. P., Lydney.
Vigis, L., Bath.
Waddington, Miss J., Bristol.
Walker, M., Staple Hill.
Watts, J. W., Clifton.
White, D. H., Clifton.
White, H. F., Clifton.
*White, J. W. (*President*), Clifton.
Wilkes, T., Cotham.
Woollatt, R., Taunton.
*Young, E. F. (*Vice-President*), Bristol.

* *Local Executive Committee.*

The Sittings of the Conference were held in

THE LECTURE HALL OF UNIVERSITY COLLEGE, BRISTOL,

On TUESDAY & WEDNESDAY, JULY 28 and 29, 1903,

Commencing at Ten a.m. each day.

TUESDAY, JULY 28.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.; and at 2 p.m., adjourning at 4 p.m.

Order of Business.

Address of Welcome by PROFESSOR C. LLOYD MORGAN, Principal of University College, Bristol.

President's Address.

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hills" Library Fund.

Report of Formulary Committee, by N. H. MARTIN, F.L.S.

Report by Dr. POWER of his visit as Delegate to the International Congress of Applied Chemistry.

Reading of Papers and Discussions thereon.

PAPERS.

1. *The Preparation of Absolute Alcohol*, by PROFESSOR SYDNEY YOUNG, D.Sc., F.R.S.
2. *On the New Pharmaceutical Institute of the Berlin University and its Arrangements*, by PROFESSOR H. THOMS, Ph.D., communicated, with lantern slides, by PETER MACEWAN, F.C.S.
3. *A New Method for the Estimation of Uric Acid in Urine*, by A. F. DIMMOCK, M.D., M.R.C.S., L.S.A., Medical Officer of Harrogate Infirmary, and F. W. BRANSON, F.I.C., F.C.S.
4. *Comparative Anatomy of the Barks of the Salicaceæ*, by PIERRE E. F. PERRÉDÈS, B.Sc. Lond., F.L.S.
5. *Willows used in Pharmacy*, by E. M. HOLMES, F.L.S.
6. *The Thermal Waters of Bath*, by W. J. HALLETT.
7. *Compressed Tablets*, by EDMUND WHITE, B.Sc., F.I.C., and HENRY RODWELL.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Royal Hotel.

WEDNESDAY, JULY 29.

The CONFERENCE met at 10 a.m., adjourning from 1 to 2 p.m. The whole of the business of the Conference was completed this day at 4.30 p.m.

Order of Business.

PAPERS.

8. *Liquor Rhei Concentratus and Liquor Sennæ Concentratus*, by F. C. J. Bird.
9. *Chemical Examination of Kô-sam Seeds*, by Frederick Power, Ph.D. and Frederic Lees.
10. *A False Cusparia Bark*, by E. W. Pollard, B.Sc.
11. *Note on Compound Tincture of Benzoin*, by Alfred Wright, Ph.C.
12. *The Future of Pharmacy*, by Leo Atkinson.
13. *Balearic Botany*, by J. W. White, F.L.S.
14. *Crystals in Extracts*, by F. H. Alcock, F.I.C.
15. *Note on Hyoscyamus muticus*, by F. Ransom, F.C.S., and H. John Henderson, Ph.C.
16. *The Quantitative Separation of Strychnine from Quinine*, by E. F. Harrison, F.I.C., and D. Gair.
17. *Note on the Volumetric Use of Fehling's Solution*, by E. F. Harrison, F.I.C.
18. *A Comparison of Dieterich's Process for the Determination of Morphine in Opium with that of the British Pharmacopœia*, by H. E. Matthews.
19. *Ferri Arsenas P.B.*, by W. W. S. Nicholls, B.Sc.
20. *A Concurrent Curriculum*, by H. Wippell Gadd, F.C.S.
21. *Agricultural and Horticultural Poisons*, by E. M. Holmes, F.L.S.
22. *The Non-existence of Mydriatic Alkaloid in Lactuca virosa*, by J. O. Braithwaite and H. E. Stevenson.
23. *Note on the Chloroforms of Belladonna and Aconite*, by Robert Wright, F.C.S.
24. *Note on the Refractive Index of Essential Oils*, by E. J. Parry, B.Sc., F.I.C.

Presentation from the "Bell and Hills" Fund.
Election of Formulary Committee.
Place of Meeting for 1904.
Vote of thanks to Mr. F. Ransom, the retiring Hon. Secretary.
Election of Officers for 1903–1904.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Royal Hotel.

THURSDAY, JULY 30.

Excursion to Forest of Dean and the Wye Valley. For particulars see page 610.

BRITISH PHARMACEUTICAL CONFERENCE.

VISITORS TO ANNUAL MEETING, 1903.

Aberdeen—Giles, William.
Atherstone—Parkinson, F. W.
Bath—Collis, A. F.; Hallett, W. J.; Batt, Miss.
Beckenham—Parsons, W.
Bedlington—Foggan, Geo.
Belfast—Gibson, W. J., and Miss Gibson.
Benalla, Victoria, Australia—Say, Victor.
Birmingham—Alcock, F. H.
Blackburn—Yates, J. G., and Miss Yates.
Bournemouth—Bilson, F. E.; Toone, Mr. and Mrs. J. A.
Bradford, Yorks.—Hanson, Mr. and Mrs. A.; Silson, Mr. and Mrs. R. W.
Brighton—Savage, W. W.; Yates, C. G.
Bristol—Allen, B.; Berry, William; Boorne, H. E.; Buxton, F.; Chandler, Mr. and Mrs. John; Chandler, R.W.; Collis, J. T.; Ellis, F. R.; Hill, E. W.; Matthews, Mr. and Mrs. H. E.; Newman, Robt.; Plumley, J. G.; Rutheby, John; Taylor, A. L., and Mrs. Taylor; Turner, G. T.; Young, E. F.
Cambridge—Church, E. H.; Peck, E. Saville.
Cardiff—Deane, Robt.; Jones, Jabez A.
Castle Cary—Moore, F. S.
Cheltenham—Barron, W.; Mansbridge, M. C.; Stewart, Jas.
Chesterfield—Smith, F. A. Upsher.
Dowlais—Rees, R. P.
Dover—Ewell, R. M.
Dublin—Beggs, Mr. and Mrs. G. D.; Robinson, Sir Thomas, and Lady Robinson; Wells, W. F.
Dundee—Anderson, A. B.; Cummings, W.; Kerr, C., and Misses Kerr; Russell, James; Thomson, Mr. and Mrs. J. H. (Lochee).

Edinburgh—Care, Mr. and Mrs. H. Bristowe; Cowie, W. B.; Gibson, A., and Miss Gibson; Hill, J. Rutherford.

Exeter—Gadd, Mr. and Mrs. H. Wippell; Lake, J. Hinton; Wilton, T. C.; Luxton, Fred; Tickle, T.; Vinden, Mr. and Mrs. F. W.

Glasgow—Brodie, R.; Currie, Mr. and Mrs. W. L.; Maben, T.; Maben, T. M.; Reid, Miss; Robertson, Geo.

Godalming—Mather, J. H.

Gravesend—Clarke, Mr. and Mrs. R. Feaver.

Harrogate—Wilson, J. H.

Hendon—Goldfinch, G.

Hitchin—Ashton, Mr. and Mrs. F. W.; Ransom, Mr. and Mrs. F.

Leeds—Branson, F. W.; Sargeant, F. Pilkington.

Leicester—Todd, Mr. and Mrs. R. McLaren, and Miss Todd.

Leytonstone—Brewis, E. T.

Liverpool—Evans, Ed., junr.; Evans, W. Herbert; Marsden, Prosper H.; Shacklady, J.; Symes, Dr. C. and Mrs. Symes.

London—Atkinson, Mr. and Mrs. Leo; Bascombe, F.; Betty, R. B.; Bird, F. C. J., and Miss Bird; Bourdas, I., and Miss Alice Bourdas; Bowen, J. W.; Bremridge, R.; Cofman, J.; Cooper, Albert; Cresswell, F.; Glyn-Jones, Mr. and Mrs. W. S.; Hearn, J.; Holmes, E. M.; Howard, Mrs. and Miss; Humphrey, John; Idris, T. H. W.; Idris, Herbert; Miss Idris; Layman, F. N.; Lescher, T. Edward; McEwan, Peter; Naylor, W. A. H.; Power, Dr. F. B.; Robinson, W. Prior; Stevens, Mr. and Mrs. P. A. E.; Tyrer, Thomas; Umney, Mr. and Mrs. J. C.; Want, W. Philip; Watson-Will, Mr. and Mrs. W.; Weld, C.; Weston, S. J.; White, Mr. and Mrs. Edmund.

Manchester—Clementi, Miss; Johnstone, C. A.; Kemp, Harry; Lawton, Mrs.; Pidd, A. J. and Miss Pidd; Wild, John.

Markinch, Fife—McCorquodale, Mr. and Mrs. J. C.

Newcastle-on-Tyne—Merson, Mr. and Mrs. G. F.

Newport, Mon.—Ayland, Miss E. M.

Oxford—Druce, G. Claridge.

Peebles—Lindsay, Mr. and Mrs.

Peterhead—Tocher, J. F.

Plymouth—Turney, J. Davy; Woods, Mr. and Mrs. W. H.

Ryde, I. W.—Pollard, E. W.

St. Leonards-on-Sea—Hall, J.

Salisbury—Atkins, Mr. and Mrs. S. R.

Sheffield—Antcliffe, H.; Fox, A. Russell; Fox, H.; News-

holme, Mr. and Mrs. G. T. W., and the Misses Newsholme; Squire, Mr. and Mrs. Geo.

Sidcup—Harrison, E. F.

Southsea—Blanchflower, G. P.

Swansea—Grose, W. M.; Hughes, Jas.

Tunbridge Wells—Hobbs, Mr. and Mrs. A.E.

Wimbledon—Gerrard, A. W.

Woolwich—Goldthorpe, A.; Still, D. W.

Yeovil—Wright, Alfred.

GENERAL MEETING.

Tuesday, July 28, 1903.

The Fortieth Annual Meeting of the Conference commenced its sittings in the Lecture Hall of University College, Bristol. The chair was taken at 10 a.m. by the President, Mr. T. H. W. Idris, who was supported by Mr. S. R. Atkins and Dr. Charles Symes (Past Presidents), Messrs. Ransom and Peck (Hon. Gen. Secs.), Mr. J. C. Umney (Treasurer), Mr. G. D. Beggs (President of the Pharmaceutical Society of Ireland), and Professor Lloyd Morgan (Principal of University College, Bristol).

The PRESIDENT called upon Professor Lloyd Morgan, who extended a cordial welcome to the Conference in the following terms—

Mr. PRESIDENT, ladies and gentlemen,—I have the honour to say a few words of welcome to you to the University College, Bristol. The words shall be few, because it has been well said that neither welcomes nor partings should be unduly prolonged. When I had the honour of suggesting to the Council of University College that your meetings should be held in this building, that suggestion was at once adopted. It seems to me University College is a fit and proper place in which you should be welcomed, because your work is specially characterized by exactness, and we in University College, at any rate, hold up the ideal of exact and careful work. We endeavour, as you endeavour, to promote efficiency and elegance. I owe these two terms to a member of your profession with whom I travelled across the Atlantic. He came from the other side, and he maintained that the characteristic of your work in recent years had been a marked increase in efficiency and elegance. I asked him exactly in what respects he would lay stress upon these two points. "Well," he said, "the

time has gone by when we used just to put something in which affected the whole constitution and just worried around, and perhaps did good in the end—perhaps not. What we aim at now is something that will stick strictly to business, and not go fooling around the constitution; and that, sir, is efficiency." "Yes," I said, "and elegance!" "Well, sir, when I was a boy it was a real terror to have to take any medicine. We have changed all that now. Now, sir, it has added a new joy to existence." Well, you are cultivating efficiency and elegance; and we in University College, in our department, endeavour to cultivate efficiency and elegance. Every one can do this. Do not these two, seriously regarded, pretty well touch the keynote of efficient, elegant, and exact work? Must not good work stick strictly to business, and not go fooling around the constitution—and is not elegant work just that which gets rid of the unnecessary redundancies? The two combined are what might be regarded, perhaps, as forming the tonic and dominant of good strong exact work. And just as it is our object to cultivate these two excellencies, for that reason I think I may claim that University College is a fit and proper place in which you should meet. That your Conference may be a thorough success is not only my hope and belief, but my confident anticipation. I hope you will have some interesting excursions, that you will feel that Bristol has given you a welcome, and that you have enjoyed your time here and have profited by your visit. Without occupying your time any further, I beg most heartily to welcome you to the University College, Bristol.

The PRESIDENT, in thanking Professor Lloyd Morgan, said: It is my duty to thank you very heartily for the cordial welcome you have given us and for the kindly appreciative remarks you have made respecting our calling. We cannot have a more cordial welcome than you have given us. I am sure also that we cannot have better premises, more suitable, fit premises to meet in than these which you have given us the opportunity of using. As a reader of some things that you have written, Mr. Principal, I have often wondered whether the pleasure afforded your readers has been similarly experienced by those who have been instructed by word of mouth, and I can fully realize that the latter are as much favoured as those who were instructed by reading your books. No additional words of mine would further express the sincerity of our thanks to you and the pleasure we have derived from being received by you. To me it is an added pleasure to know that you are a native of the big city of my adoption. For the very kind

manner in which you have received us we tender you our most hearty thanks.

Mr. ATKINS (President of the Pharmaceutical Society), who was called upon to add a few words, said: I think it is a work of supererogation to ask me to say anything further than you, Mr. President, have so well already expressed in our thanks to the Principal for his very gracious lending of these premises for our use during these meetings, and for the very thoughtful address he has given this morning. I desire to associate myself with you in thanking the Principal for the reception and welcome. We had last evening a welcome from the municipality of this great city, and a very cordial welcome it was from the Lord Mayor. May I say this morning we have received a very hearty welcome from the intellectual—I do not mean to say the other side is not intellectual—but strictly from the intellectual or educational side of this great city's work? We know what this great city is doing in the way of educational work, and I believe we are entirely in sympathy with this work. Mr. Principal, it is a great thing that the British Pharmaceutical Conference and the Pharmaceutical Society (of which I have the honour to be President) should take due note of this. We are, I may say, two distinct bodies. There are two Richmonds in the field. To-day I yield to my friend, the President of the Conference, in every function connected with this movement; but we desire more and more to associate ourselves in the educational work of the country with the Universities. We all send—and I trust we *shall* send—our sons and daughters to receive their scientific training there; and I am sure of this, that if we send them, you, Mr. Principal, and the sister Universities will return them to us highly trained and highly cultured.

PRESIDENTIAL ADDRESS.

PHARMACY AS A RESPONSIBLE CALLING.

BY T. H. W. IDRIS, L.C.C., J.P., F.C.S.

I am proud to have the honour of presiding over this Conference at this, its second visit to Bristol, after an interval of twenty-eight years, when Mr. T. B. Groves presided over a meeting in this city, a city which by me, during my earlier years as a pharmacist, was regarded as the Capital of the West, which title it may justly claim. When I look through the list of my

predecessors in this position, I am forcibly impressed with the responsibility that rests on me, and of the necessity for me to ask for your indulgence and for your assistance in sustaining me in my attempt to do my duty. Three of my predecessors have been Fellows of the Royal Society, and all the previous occupants of this office have been men of distinguished ability and scientists of no mean order. I cannot hope to approach the scientific address of my immediate predecessor, nor the able addresses of those who have interested you in former years, but I can ask you to join with me in being thankful that our lives and theirs have been bound up with pharmacy. These men's lives remind us of the possibilities of our calling. It is obvious that an occupation so interesting as ours, involving manual and mental training, and the pursuit of learning of so wide a range, must have inherent possibilities of an extensive order, and that no business can be more compatible with intellectual culture. In former days our calling was almost the only avenue to scientific chemistry, and in our own day no inconsiderable accession has been made to chemists of the first rank by students of pharmacy. Although pharmaceutical students are too frequently satisfied with only getting up the chemistry necessary for passing the qualifying examination, and place no great store on the possibilities arising from what they have acquired, there are abundant examples which prove that the possibilities are great, and that the possibilities increase with every extension of knowledge of the science.

Opportunities for Using Knowledge.

It is said that opportunities occur exactly in proportion to the ability to take advantage of them. This is probably true. It is also maintained that ability creates the opportunity; this is probably true, too, as it is certain that ability points out the road to opportunity. No matter how small or how great the knowledge, opportunities for utilizing it in the service of our fellow-beings, and to our own advantage, will certainly occur. It is well known to everybody from personal experience that opportunities for using knowledge always occur in a much greater ratio than the knowledge available, and, further, that in almost every life opportunities occur for utilizing all the knowledge that has been gained. Three pharmacists that I and most of you had the pleasure of knowing (who have passed away since our last meeting) may be mentioned as illustrations; our valued colleague, Frederick Baden Benger (one of my predecessors

in this chair, who rendered important services before that time as Secretary of this Conference), John Robbins, and Gustav Mellin. These three men all made real and important improvements in articles of common use through applying science to their production, thus rendering real public services and gaining for themselves large financial rewards. I had the pleasure of knowing Mr. Robbins intimately, and from him and from the late Sir B. W. Richardson I had many interesting particulars concerning Mr. Robbins' first step on Fortune's ladder. Very briefly stated, it happened in this way.

The Romance of Hydrogen Peroxide.

Sir Benjamin Ward Richardson was preparing a lecture to be delivered at the Royal Institution, and wished to procure some peroxide of hydrogen for one of his illustrations. He tried several chemists, but failed to obtain as strong a preparation as Thenard had previously obtained. Sir Benjamin's difficulty came to the ear of Mr. Robbins one night; Mr. Robbins stayed up nearly all that night, and finally succeeded in producing the article of the required strength. The next night, about ten o'clock, after the shop was closed, he took his bottle of peroxide to Sir Benjamin's house, and after some difficulty obtained an interview. Sir Benjamin was engaged in his laboratory repeating unsuccessful attempts to produce the article, and on testing the contents of Mr. Robbins' small bottle was delighted to find it to be just what he required. "You must let me have a couple of pints of this," said the scientist. "That is not possible," said Robbins, "I cannot prepare it at my employer's; I am an assistant to Mr. Garden." "Then come to my laboratory," said Sir Benjamin. So Robbins obtained leave of absence, and made the peroxide in Sir Benjamin's house. In giving his lecture, Sir Benjamin acknowledged his indebtedness to the young chemist's assistant. Many uses for the preparation were speedily found, and Mr. Robbins was quickly on the road to fortune, although when he worked at it all night he did it without the slightest idea of any pecuniary result, but simply with a desire to overcome a chemical difficulty. This also illustrates the delight that comes from taking pleasure in one's business.

Excitement a Necessity of Life.

Some form of excitement, some hobby is, I believe, a necessity of life. "Happy is the man that findeth wisdom and the man

that getteth understanding." "Her ways are ways of pleasantness and all her paths are peace." In our calling we are fortunate in being able to connect our business with the delights of the microscope and the spectroscope, and with almost every branch of natural science. The reading of our pharmaceutical and scientific journals will often reveal exquisite possibilities to a thoughtful and well-informed reader, even if we imagine possibilities that do not exist. Still, if we err at all, it is better to err on the side of dreaming too much rather than too little. In my experience it may be said of the chemist's shop parlour:—

> Strange things pass nightly in this little room,
> All dreary as it looks by light of day;
> Enchantment reigns here when at evening play
> Red fire-light glimpses through the pallid gloom.

But it is not only in the study, in the home, and in the shop that scientific studies connected with our business yield pleasure, but untold delight is the result when we wander abroad. Here I should like to quote from Hudson and Gosse's beautiful work on the *Rotifera*, especially as it refers to this delightful part of the country:—"On the Somersetshire side of the Avon, and not far from Clifton, is a little combe, at the bottom of which lies an old fish-pond. It is a true silent pond, and without a sign of life." . . . "But if, retaining sense and sight, we could shrink into living atoms and plunge under the water, of what a world of wonders should we then form a part! We should find this fairy kingdom peopled with the strangest creatures—creatures that swim with their hair, that have ruby eyes blazing deep in their necks, with telescopic limbs that now are withdrawn wholly within their bodies, and now stretched out to many times their own length. Here are some riding at anchor, moored by delicate threads spun out from their toes; and there are others flashing by in glass armour, bristling with sharp spikes or ornamented with bosses and flowing curves; while fastened to a green stem is an animal convolvulus that, by some invisible power, draws a never-ceasing stream of victims into its gaping cup, and tears them to death with hooked jaws deep down within its body. Close by it, on the same stem, is something that looks like a filmy heart's ease. A curious wheelwork runs round its four outspread petals; and a chain of minute things, living and dead, is winding in and out of their curves into a gulf at the back of the flower. What happens to them there we cannot see; for

round the stem is raised a tube of golden-brown balls, all regularly piled on each other. Some creature dashes by, and like a flash the flower vanishes within its tube. We sink still lower, and now see on the bottom slow gliding lumps of jelly that thrust a shapeless arm out where they will, and grasping their prey with these chance limbs, wrap themselves round their food to get a meal; for they creep without feet, seize without hands, eat without mouths, and digest without stomachs."

The Delights of Botany.

The delights of botany are well described by my predecessor in last year's address:—"Like the apothecaries of old, we live straitened lives, but we can increase their brightness by pursuing in our leisure hours a science such as the one I am mentioning; and by recording such interesting facts as Nature from time to time may reveal to us, we may do something to explore a small portion of that vast forest of the unknown, by which even in the twentieth century we are surrounded, or lighten to some extent the gloom of ignorance which enshrouds some of Nature's problems, and which even the rays of the electric light have not at present illuminated." True it is, as I heard the late Dr. H. B. Brady say in an address at the Square, these lines which I have never forgotten, that:—

Nature never did betray
The heart that loved her; 'tis her privilege
Through all the years of this our life, to lead
From joy to joy; for she can so impress
With quietness and beauty, and so feed
With lofty thoughts, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Nor greetings where no kindness is, nor all
The dreary intercourse of daily life,
Shall e'er prevail against us, or disturb
Our cheerful faith that all which we behold
Is full of blessings.

Essential Oils and their Constituents.

I will not attempt to discuss the progress made in any of the branches of science connected with our calling, but I think it will be desirable to mention two subjects connected with my own avocation that will be of interest to almost every pharmacist. The first is that of essential oils, a group of bodies that have attracted so much attention in recent years. In discussing the

composition of these bodies it should always be borne in mind that they are necessarily of a very indefinite nature, and that they vary in composition to a remarkable extent, depending on such a variety of causes and conditions, such as cultivation, temperature, humidity, soil, sunshine, variety of the plants, maturity of the portion from which the oil is obtained, and so many other circumstances that to start with considering them to be definite mixtures of chemical compounds, and to generalize on a few particular experiments, is very dangerous, and every endeavour should be used to obviate such a possibility. But it is one which is always hard to resist, and unfortunately has sometimes been encouraged to a considerable extent. It is well known that lemons grown in different portions of Sicily yield oils of different optical rotations, but with fairly constant degrees of rotation in each particular district. Black and white peppermint appear to alter from one variety to the other in different climates, and mint grown in different countries yields very different oils, as shown by John C. Umney. More attention has been recently paid to a branch of this subject which has been greatly neglected. I refer to the development of the various constituents of essential oils during the growth of the plant. Much information can be gathered in this quarter, in a few cases, on account of the fact that certain plants yield several oils in regular sequence, which can be periodically and frequently examined. For example, a pure orange flower oil—the oil distilled from the orange peas, as they have been termed—and normal orange oil are well-known articles of commerce, and have been sufficiently well examined to prove that the terpenes are developed with the maturing of the fruit.

The Development of Esters.

But it is in such cases as the development of the esters in lavender oil, etc., that one must examine the oils under less favourable conditions. In this department, Charabot has particularly interested himself, and has, amongst other conclusions, stated that the formation of esters in the plant takes place by the direct action of acids on alcohols; it is favoured by a kind of enzyme which exerts its dehydrating action inside the chlorophyll granules. A careful perusal of Charabot's various papers, however, leaves one with the feeling that the conditions of the experiments were not such as to allow very safe deductions to be drawn from them yet. The possibility of determining accurately a definite constituent of an essential oil is very tempting, and frequently biases

one so that an attempt is made to value the oil on such a basis. This is most marked in some cases in which it should be so—that is, where it has been pretty clearly decided that the constituent is the only valuable one present—such as, I think I may say, the cineol in eucalyptus oil. But the fact that the constituent is easily determined should be severely put aside in forming an opinion on the matter. I take lavender oil as a type. I express no opinion on the point, but there are two opposite schools of thought here—the one urges that lavender oil should invariably be valued on its ester contents; the other holding that such a valuation is useless. In Leipzig the oil is sold on such ester value, whilst in the home of its production, the south of France, it is not. Parry has stated that some of the finest oil of the Italian frontier contains but 25 per cent. of esters, and John C. Umney has stated that some oils with over 40 per cent. of esters are very rank, although he believes that the ester value is a useful basis for classifying oils below 40 per cent. Messrs. Schimmel are the chief supporters on the Continent of the ester value, whilst the majority of the actual distillers are quite averse to it. The need of continued researches before coming to any conclusion is therefore obvious. Many more examples of endeavour to draw hard and fast conclusions before the time is ripe for them might be given, but time will not allow me to more than call attention to the point in the way I have just done. An important discovery of the past few years is the detection of a few nitrogenous compounds in certain essential oils. Of these the most important is methyl anthranilate, the peculiar amido-acid first found in neroli oil. This odorous ester was discovered in oil of neroli by Erdmann, and soon after in oil of jasmin by Hesse and Müller. It was then shown to be present in the oils of orange, orange peas and lime flowers by Parry, and in mandarin oil by Walbaum. Charabot then found it, together with methyl methyl-anthranilate in mandarin leaf oil, and John C. Umney has detected it in Chinese neroli oil. The discovery of the open chain alcohol, nerol, an isomer of geraniol, by Hesse and Zeitschel this year is interesting and important, as hitherto the only known alcohols of this series found in essential oils were geraniol, linalol, and citronellol.

Sandal Wood and Lemon Oils.

Sandal wood oil has been the subject of numerous researches during the past few years. The earliest work on the subject is

that of Chapoteaut, which was followed by Parry, who observed that Chapoteaut was working on adulterated oil, and that the oil consisted almost entirely of alcoholic constituents and not aldehyde. Since then numerous Continental chemists have taken up this subject, and it is now clear that the so-called santalol is a mixture of at least two isomeric sesquiterpene alcohols, and that the bodies present in the West Australian and West Indian oils are quite different from them. Hence the oils from the two last-named sources should hardly be called sandal wood oil at all. The chemistry of lemon oil has been a fruitful study of recent years, and I am glad to recognize that the work has to a very considerable extent been accomplished by English chemists. It is not long ago that we regarded lemon oil as little else than terpene; when citral was found some believed that the chemistry of lemon oil was settled. Although a great many bodies have now been found in the oil, the most important (recently discovered) are the esters of geraniol and linalol, discovered by Umney and Swinton, and the aldehydes, octyl and nonyl aldehydes, for which credit is due to Burges and Child. If lemon oil be distilled under ordinary pressure—a proceeding the expediency of which in analytical processes is open to considerable doubt—the first 10 per cent. will naturally consist in the main of terpenes. It had been observed that many samples under such treatment yielded a distillate, which differed only a degree or so in its optical rotation from that of the original oil. On a comparatively few experiments—and possibly relying on a now admittedly incorrect statement of Schimmel that lemon oil contained no trace of pinene—the last edition of the British Pharmacopœia directs that 2° shall be the maximum difference in rotation. Now the same sample of lemon oil, if distilled under reduced pressure, and under suitable fractionating apparatus—which is the rational method of conducting the test—will often yield a distillate which has a different figure of 8° or even 12° in rare instances. Where did the absurd first advocated standard of 7 to 8 per cent. of citral in lemon oil come from? Was it through a few exceptional samples, or was it through a mistake in the analysis of the oils? I take up several price-lists, and find lemon oil guaranteed to contain 7 per cent. of citral. I think I am not exaggerating when I say that such a sample is practically never met with. If it were we would easily obtain from 12 to 15 per cent. of terpeneless oil from natural lemon oil, which is admittedly absurd. The work on this group of oils has led to the patenting in Germany of artificial oils of

lemon and mandarin. It is probable that such patents will die a natural death, but attention should be called to them. I might spend the whole of the time at my disposal on this interesting subject, but my object is merely to point to the matter and leave those interested in it to follow it up for themselves.

The Adulteration of Essential Oils.

Before leaving the subject of essential oils, I feel compelled to draw attention very briefly to one other aspect of it. I mean the adulteration practised in commerce. Time was when adulteration was very coarse and very frequent. It is still very frequent, unfortunately, but it is not now so coarse. With the development of our knowledge of the chemistry of the oils, the refinements in adulteration have grown. And it becomes a continual struggle between the honest chemist and the dishonest but skilful adulterator, as to who shall circumvent the other. Compare the old adulteration of lemon oil with turpentine with the mere dilution with lemon terpenes. Petroleum oil and camphor oil are still regular adulterants of peppermint oil, but glyceryl acetate is far more ingenious, and has been recently found by C. T. Bennett. A small percentage of cocoanut oil is common in lemon-grass oil, but 5 per cent. of acetone has much greater chances of passing unnoticed, and has recently been found by Parry. The "scientific" adulteration of the oils of citronella, peppermint, lemon, otto of rose, spike lavender, and many others has reached alarming proportions, and they should be watched with great care. For years a solubility test was accepted as a guarantee of the purity of citronella oil, simply because American kerosene was the usual adulterant, and rendered the oil insoluble in 80 per cent. alcohol. The wily adulterator naturally sought a fresh adulterant, and for years past many hundreds of tons of adulterated citronella oil must have come into this country and been accepted merely because they passed Schimmel's test. But the recent work of Parry, Umney, and Bennett has exposed the extent of this adulteration, and caused a fresh standard of purity to be looked for. I am informed from quite reliable sources that not 5 per cent. of the citronella oil of the market is now pure. This can only be regarded as a disgraceful state of things, and it is only by the most scrupulous care that such dishonesty can be checked.

The Advantages of Refrigeration.

The second matter of present interest in my own branch of

manufacture is the recently recognized enormous advantages of refrigeration applied to the manufacture of aërated or carbonated beverages. If water be cooled to the temperature of greatest density, or to about 4° Centigrade, the necessary amount of carbon dioxide is absorbed so readily that a pressure of two atmospheres in the carbonating vessels is found to be sufficient for the manufacture of soda water instead of, as at present, five to twelve atmospheres being required at normal temperatures, and soda water at the reduced temperature mentioned can be practically treated as a still liquid, as no serious disengagement of gas takes place until the temperature has been allowed to rise. It will at once be realized that under these conditions the bottling of aërated waters becomes a much more simple and rapid process than that which now obtains. The breakage in the bottling machines is greatly reduced, the danger to the operatives is consequently materially lessened, greater economy in production is obtained; but the most important advantage is that of uniformity in the quality of the product and in the pressure in the bottles. The system is in full operation in several factories in America and in Germany, but, as far as I am aware, it is not in full operation in any factory in the United Kingdom, but it has been partially adopted, and arrangements are now being made for its complete adoption in more than one factory in England, and it appears to me that it must of necessity be adopted by every good-class manufacturer. As the refrigerating or ice-making plant required must necessarily be of sufficient capacity to refrigerate the greatest amount of water required to be treated during the busiest working day, it necessitates a considerable expenditure in first cost, and as the working hours of any factory are necessarily less than one-third of the hours in the week, and considerable waste is involved in recovering reduced temperature after every stoppage, it appears to me that to work the process economically the refrigeration must necessarily be carried on continuously, and the cold produced beyond the usual factory hours must be utilized in ice-making or in some other way.

Report of the Committee on Poisons.

Since our last meeting the Departmental Committee on Poisons has issued its report. It is well known to you all that this Committee was appointed as the result of an energetic and well-organized agitation by the proprietors and manufacturers of secret poisonous compounds sold for use in connection with various

agricultural and horticultural operations, organized by a solicitor acting in the interests of these manufacturers, and promoted in the House of Commons by a maker of these poisonous compounds. The finding of the majority of this Committee was, broadly, what was desired by the makers of these compounds—that is, that poisons for use in connection with agriculture or horticulture should be freed from the restrictions now placed on their being sold, although the most important portion of the evidence and a minority report by Mr. Walter Hills pointed out the grave public dangers that would ensue from the lessening of the present restrictions. No Bill based on this report had yet been introduced, but a most instructive commentary on the report is afforded by the fact that a Bill for the Compulsory Dipping of Sheep was introduced by the Department of Agriculture, when it soon became evident to the late President of the Board of Agriculture that more information on the subject was necessary before the Bill could be passed, and that it was desirable that positive information should be obtained as to whether the use of poisons was necessary, and also as to what preparations would be most effective in use for the purpose. The Bill was therefore withdrawn, and a Departmental Committee has been appointed to conduct an inquiry as to the composition and essential constituents of efficient dips and other preparations for the treatment and dressing of sheep, etc. Another most significant commentary on the origin of the Poisons Committee and its findings is afforded by the prosecution by the Pharmaceutical Society and conviction of the firm with which Mr. Cross, M.P., and a member of the Poisons Committee, is connected, for the illegal sale of the "Ballikinrain Ant-Destroyer," a preparation of arsenic put up in a most dangerous, sweet, and seductive form, costing about 3½*d.*, and sold for 2*s.* 6*d.*, a form that no chemist would for a moment assume the responsibility of selling, and at a rate of profit so enormous that it could not be justified. It is to be hoped that in any future legislation the indiscriminate sale of such a preparation will be made still more difficult than it is at present, and that the taxing of agriculture and horticulture by such inordinate profits will be made impossible by the recommendation of the most desirable remedies, and by the fixing of reasonable prices by the Board of Agriculture. Nothing is more certain than that chemists are far more anxious to be restricted and assisted in the carrying out of their responsible duties under the Pharmacy Act than they are to make profits out of such sales, for the grave dangers to the public and the

heavy responsibilities connected with sales of poisons are always present to the chemist, and his experience impresses them on him. It would be easy for me to pile up evidence in support of these statements, but time will not permit me to notice more than two aspects of the question not at present realized by the public, i.e., (1) The impunity with which the criminal poisoner is enabled to carry on his or her operations; and (2) the very slight protection to the public that is afforded by the present system of death certification.

Certification of Causes of Death.

The two most important Government inquiries into matters relating to the death certification during recent years have been those of:

1. The Select Committee, appointed in 1893 to inquire into the sufficiency of the existing law as to the disposal of the dead, for securing an accurate record of the causes of death in all cases, and specially for detecting them where death may have been due to *poison*, violence, or criminal neglect.

2. The Departmental Committee, appointed in 1902 to prepare a draft of the regulations to be made by the Secretary of State in pursuance of the powers given him by Section 7 of the Cremation Act, 1902.

It is not too much to characterize the evidence before these two bodies as "revelations," and it has a distinct bearing on the question of death certification in relation to poisoning. For instance, the Death Certification (1893) Committee reported that: "So far as affording a record of the true cause of death and the detection of it in cases where death may have been due to violence, *poison*, or criminal neglect is concerned, the class of certified deaths leaves much to be desired." The Registrar-General deposed that "never a year passed in which he did not have to prosecute some doctor for giving false information on the certificate." In the Report of the Cremation Committee it is stated: "We have also had to consider the possibility of cases in which the person who would naturally give the death certificate is himself the murderer." Dr. W. Wynn Westcott pointed out in a paper (*British Medical Journal*, December 6, 1902) that the London County Council had long since drawn up recommendations which had been presented to successive Lord Chancellors and Home Secretaries, and which recommended *inter alia*: "That no death should be registered without a certificate of the cause of death, signed by a registered medical practi-

tioner or by a coroner, that no such certificate should be given until after inspection of the dead body, and that the certificate must include a declaration of the absence of the signs of poison, violence, accident, or criminal neglect."

Medical Certificates and Ambiguous Symptoms.

No means exist for the critical examination of medical certificates, and the ambiguity of the symptoms often enables the secondary cause of death to be registered with the concealment of the primary cause. With burial the body can of course be exhumed, in the event of suspicious circumstances arising afterwards, but—although the strictest investigation before by the cremation authority is devised to prevent it—we cannot overlook the facts that cremation destroys the evidence of crime, and that the Cremation Committee (1902) disclaimed the idea that "any possible restrictions can guard completely against the risk of cremation being used for the concealment of crime." It must not be forgotten that about 3,000 burials take place every year in this country without any death certificate, and it is fairly certain that criminals who are acquainted with the effects of poisons would not be at all likely to select any means of effecting their objects other than some form of poison. Mention may be made here of some of the celebrated murders mentioned in the above reports which have a bearing on the matter by reason of a certificate or a burial order, either false or careless, being relied on to successfully hide the crime.

Notorious Poisoning Cases.

1. *The Rugeley Murders* (1855–6). The murderer was Dr. William Palmer, of Rugeley. The body of Ann Palmer, his wife, had been 15 months in the grave under a certificate of "bilious cholera." J. P. Cook died suddenly and *Palmer gave the certificate.* On exhumation of Cook's body there was evidence of poisoning by strychnine, and antimony was also found in his body. The antimony was used by Palmer to expel the strychnine. Mrs. Palmer's body was exhumed and antimony found in her body. "The history of the illness," says Dr. T. Stevenson, the Home Office Analyst, "shows that the symptoms were consistent with the effects of tartarated antimony, but not with those of 'bilious cholera' or any other disease. Antimony had not been prescribed for her during her illness." The conviction for the murder of Cook

led (according to the *Quarterly Review*) to the exhumation of six other victims of Palmer, murdered by various means.

2. *Catherine Wilson* (1862), convicted for the murder of Mrs. Soames, while nursed by the prisoner. The body was exhumed, but no poison was found in the remains; yet the medical and other circumstances proved to the court that deceased had been destroyed by vegetable poison - probably colchicum. From the facts at the trial it was proved that deceased was one of *four* victims of the prisoner.

3. *Winslow* (1860), indicted for the murder of his mistress, Ann James, to whom, it was clearly proved, antimony had been administered. The prisoner, however, was acquitted, owing to the difficulty of proving the administration. Three relatives of the woman James were also proved, after exhumation, to have died from antimony poisoning. The cause of death was not suspected at the time.

4. *Dr. De la Pommerais* (1864), convicted in Paris of the murder of a woman named Pauw, whom he insured. She died from digitalin poisoning. He found no difficulty in getting a certificate for "gastritis and perforation of the stomach."

Cremation in Poisoning Cases.

5. *The Famous Besançon Case.* In 1854 the learned chemist Henri Deville, whilst Professor and Dean of the Faculty of Science at Besançon, was called upon to perform a medico-legal investigation of a case in which an entire family had died during an epidemic of cholera. The six members of the family were exhumed, and four of the six were found to have died from arsenic at the height of the cholera epidemic. The murderer, who would inherit the property, hoped that from the similarity between the symptoms of cholera and those of arsenic poisoning, his crimes would remain unknown for ever. Commenting on this crime, Professor P. Brouardel (who, as director of the Morgue, obtained perhaps an unequalled experience of medico-legal cases) says in his invaluable book *Death and Sudden Death* that "If these bodies had been submitted to cremation the toxicological analysis would have been impossible." It is only fair to add, however, that whether the bodies could have been cremated in this country at the present time is extremely doubtful. The certificates required under the Cremation Act, 1902, viz.—(1) an application for cremation making certain declarations; (2) registrar's certificate; (3) certificate of medical attendant; (4) confirmatory medical certificate, and (5)

authority to cremate, signed by the medical referee of the cremation company, have not been sufficiently long in vogue to allow of an opinion as to their efficacy as a check on the concealment of crime.

6. *Dr. E. Pritchard*, of Glasgow (1865), charged with the murder of his wife and mother-in-law, by administering tartarized antimony, aconite and opium to the latter in tapioca, in porter or beer, and in Batley's sedative solution, and by administering tartarized antimony and aconite to his wife in articles of food and medicine. He certified that his mother-in-law died of paralysis, and his wife of gastric fever. He was executed.

7. *Mary Ann Cotton* (1873), indicted for the murder of her stepson. The body was exhumed and arsenic found to be the sole cause of death. She was convicted. It is stated on well-ascertained facts that she had murdered, by poisoning, her mother, fifteen children, three husbands and a lodger—making in all twenty persons in a few years. They died rather rapidly one after the other, and the medical man assigned "gastric fever" as the cause of death when the symptoms were not consistent with this disease. Commenting on this trial, Dr. T. Stevenson says: "The trial and conviction of this criminal for those insurance murders brought to light another fact, viz., the great insecurity of life in this country, owing to the perfunctory manner in which some medical men discharge an important duty in filling up certificates of the cause of death. With fully-marked symptoms of arsenical poisoning, these sudden and violent deaths were registered one after the other as 'gastric fever.'"

8. *Higgins and Flannigan* (1884) committed a murder by means of arsenic, and no fewer than ten other persons, all of them duly certified and buried, are afterwards proved by exhumation to have been destroyed by them in the same way. They had procured fly-papers, soaked them in water, and administered the liquid to the deceased. The use of these fly-papers for poisoning illustrates in the strongest manner the desirability of prohibiting the unnecessary use of poisonous materials for any purpose in which non-poisonous articles would be equally suitable.

More Recent Murders by Poison.

9. *Neill* (1892) murdered Matilda Clover by strychnine. Her body was exhumed. The Treasury prosecuted "the apothecary" or "L.S.A." who gave the certificate of death, for unlawfully and wilfully making a false certificate of death (delirium tremens). He

had not attended her, nor seen her when dead, but relied on the statements of a brothel keeper and her servant.

10. *Chapman* (1903), executed for the murder of his "wives." There were three at least of them who died from antimony poisoning. The first "wife" was certified as having died from phthisis, the second from gastric enteritis, and the detection of arsenic first, and antimony later, in the body of the third, led to the discovery of the crimes. The record of the sale of antimony kept by the chemist was most material evidence in proving poisoning by antimony.

11. At Bilston some few years back two children were killed by antimony, and two months afterwards the body of a third child was exhumed and antimony found in its body, although in this last case the cause of death had been certified as "asthenia and gastric fever."

12. Surgeon-Major Cross (1887) poisoned his wife with arsenic and strychnine, registering her death as due to "typhoid."

The number of these illustrations could easily be increased tenfold, but the cases that I have cited are, I think, sufficient to show the position. Dr. T. Stevenson said, in evidence before the Cremation Committee, that he had been through all the criminal cases of arsenical poisoning of which he had personal knowledge, and in 50 per cent. no sufficient suspicion had arisen in the mind of the medical attendant that the cause was one of poisoning until after death. He could not say in what proportion it arose after burial, but in the very first case on which he was employed by the Home Office the body had been buried—no suspicion arising. There was a medical certificate, and the neighbours brought about the suspicion.

Prescribing and Dispensing.

The reports and evidence of the two committees that I have quoted from have a very important bearing on another subject of great importance to the public safety—that is, the separation of prescribing from dispensing. In almost every other civilized country in the world the dangers of the prescriber dispensing his own medicine and giving his own death certificate have been realized, and the separation of the functions of prescribing and dispensing as far as possible has been enacted and enforced. It is eminently desirable in the interests of the safety of the public that this should obtain in our own country, and it may be laid down as an indisputable fact that the chemist is not by his education and

training competent to prescribe, nor is the doctor by his education and training competent to dispense. The intrusion of the old apothecaries on the domain of medicine in England and Wales has resulted in serious confusion in the public mind, and has led to public evils. It is necessary in the public interest that such another mistake in connection with medicine should not be repeated. I am glad to know from personal experience that prescribing by chemists is greatly diminishing, but in order that the separation of prescribing and dispensing should be more fully realized, it is necessary that the pharmacist should have the position that he has in other countries, and that his calling should be recognized by the State as a distinct branch of the medical profession. In order that he should attain this object nothing, to my mind, is more important than that before his scientific training as a pharmacist he should be compelled to pass an examination equal in stringency to that required on entering on the study of medicine, which would enable the pharmacist to study for the higher branches of the healing art without having to pass a further preliminary examination. The insufficiency of the present Preliminary Examination seriously handicaps the pharmacist in his scientific progress and in attaining that position that he should command in the public interest. It is not necessary for me to argue further that pharmacists ought not to prescribe and dispense their own prescriptions, but it must be recollected that the doctor is a watchful check on any blunder made by the chemist, whilst there is no check on any mistake made by the doctor who prescribes and dispenses his own medicine, because he gives his own death certificate, and it must necessarily be a serious temptation to a medical man to avoid publicity in the case of such a misfortune. It should be borne in mind that the regulations of the Pharmaceutical Society, in accordance with the Pharmacy Act, as to keeping, dispensing, and selling of poisons, are not binding on medical men nor in public institutions. These provide that chemists shall: (1) Keep poisons in bottles with a distinctive mark indicating that they contain poisons; (2) store poisons on one of three special systems designed to distinguish the poison bottles from others; and (3) send out liniments, embrocations, and lotions containing poisons in bottles distinguishable by touch, and with a label that the contents are not to be taken internally. I believe that the following list fairly represents the number and nature of the reported mistakes in doctors' surgeries, public institutions, and chemists' shops published since 1898. I have omitted names, but have

given the dates of the reports in the medical and pharmaceutical journals :—

Mistakes in Doctors' Surgeries.

1. May, 1903. Dr. —— mixed the labels for a belladonna and aconite liniment and a mixture, with the result that a prominent local gentleman was poisoned fatally. The jury returned a verdict of "Death by misadventure," and recommended that liniment should be placed in bottles of special shape and labelled "poison." The jury expressed admiration of the doctor's manly conduct in confessing the mistake.

2. November, 1902. Dr. ——, in making up a bottle of medicine for a child, labelled in error a carbolic and glycerin lotion, which was in a similar bottle. This he gave to the mother, it was administered, the child died, and the jury attached no blame to the doctor, but agreed with the coroner that a blue-fluted bottle should have been used for the poison.

3. November, 1902. Dr. ——, in making up powders for two children, by a mistake which could not be definitely explained, put in sulphate of strychnine in place of santonin. The bottles were kept in the same cupboard; one child died, the other was saved by using chloral as an antidote. The jury found "Death by misadventure," and suggested that poisons should be kept in fluted bottles and separate from other drugs. They expressed sympathy with the doctor.

4. September, 1902. Dr. —— prescribed neuralgia mixture for one woman and a mixture containing morphine for her mother. The latter visited the former, bringing her medicine, which was drunk by the daughter by mistake, and she died. The doctor, in evidence, said it was not customary to put such a medicine as the mother's in a poison bottle, as it was not *de facto* a poison to the patient for whom it was dispensed. Asked what possible objection there was for putting it in a poison bottle, he said that if she died the relatives would have a suspicion that she died from it. The coroner characterized this as a "wild" explanation. In returning a verdict of "Misadventure," the jury added that there should have been a label on the bottle indicating its poisonous contents.

5. February, 1902. Dr. —— supplied liniment of aconite and belladonna and a mixture to a woman patient in bottles "very much alike." She drank the liniment in mistake for the medicine. Jury returned verdict of "Misadventure," and coroner said it

would be advisable for doctors to strictly adhere to a rule to put such a poisonous liquid in distinctive bottles.

Confusion of Bottles in Surgeries.

6. April, 1901. Dr. —— was attending a child suffering from typhoid fever. The father called at the surgery for the child's medicine, and received a bottle (the label of which was upside down), some of the contents of which were given to the child. The doctor found that he had given the father a bottle of "tinctura ferri," instead of one produced at the inquest, labelled "for ——'s child." The evidence of one of the doctors who made the post-mortem was that the dose would have caused death even had deceased been in good health. Another doctor present at the post-mortem would not like to have said that, although he should not like to try the experiment. The jury returned a verdict of "Misadventure," and expressed the opinion that the doctor should have been more careful in dispensing his medicines.

7. March, 1901. Dr. —— employed an unqualified dispenser who, in making up powders for three children, by mistake substituted strychnine for santonin. The bottles were on the same shelf in the dispensary. The first child was buried under the doctor's certificate before the death of the other two aroused suspicion. He gave the certificate because he thought the worms (from which all the children suffered) had set up convulsions which were the cause of death. Strychnine was found in the child when disinterred. The jury found that all three deaths were caused by the administration of strychnine through misadventure, and strongly recommended that all bottles containing poison should be kept distinct and separate from other bottles.

8. March, 1901. Dr. ——, receiving an urgent call to a diphtheria case, left an unlabelled bottle of carbolic acid on his desk. Returning, he found a number of patients awaiting him, including one to whom he gave a bottle of—as he thought—physic for catarrh. The patient took some of it and died. In shape and colour the carbolic acid and the medicine bottles were alike, and the doctor labelled the former for the latter. It was not until after returning from the patient's death-bed that he found the medicine bottle on his desk and the acid bottle missing. Verdict, "Misadventure."

9. January, 1901. Dr. —— instructed his assistant to make up for a patient suffering from rheumatic gout a belladonna and aconite liniment. This was done and put in a bottle with an

ordinary label, not marked poison. Afterwards a mixture was dispensed and forwarded to the invalid. Subsequently the latter sent for another bottle of medicine, and the liniment, already made up in a bottle similar to the previous medicine, was forwarded to him, and he took 1½ oz. and died the same night. The jury found that the deceased had been accidentally poisoned, and expressed the opinion that bottles containing poisonous medicines dispensed by medical practitioners or chemists should have a distinctive shape, and be labelled "poison" on both sides.

10. January, 1900. Dr. —— always told his housekeeper to keep the belladonna and aconite liniment in the surgery. It was, however, "inadvertently left in her room" on one occasion, when it was "given" by one of the doctor's servants to a lady visiting the doctor, who was suffering from face-ache. She died, and a verdict was returned of "Misadventure."

Doctors' Lack of Care.

11. October, 1900. Dr. ——, whilst confined to the house from temporary indisposition, took a dose of opium, to the effects of which he succumbed. Two local doctors, who gave evidence, said that "medical men, when using poisons for themselves generally measured with their mouths, adding that whilst they were careful to measure for other people they were not careful for themselves." Verdict, "Misadventure."

12. December, 1900. Dr. —— wrote a prescription for a powder for an infant's arm swollen after vaccination. The prescription was for "urophen and boracic acid." The surgery dispenser read it as "morphia, 1 scruple; boracic acid, 2 drachms." There was no initial "e" to the word "europhen." The dispenser cautioned the mother that it contained poison, and labelled the powder "poison powder." The doctor, in evidence, stated that the dispenser's duty was simply to prepare medicines according to the prescription, and not to make inquiries about them. The jury returned a verdict of "accidental death," and asked the coroner to say that he hoped the doctor would, in writing prescriptions, take every means possible to avoid the recurrence of such an unfortunate mistake. As to the dispenser, the jury felt that his business was one requiring the greatest care, and they did not think that he showed quite such an intelligent interest in the matter as he ought to have done when he made up for a baby a prescription containing a violent poison. They thought he might very well have asked a question about it in the first place.

13. December, 1900. Dr. —— kept four surgeries in charge of housekeepers. An application was made at one of these for the doctor's attendance on a woman. His housekeeper telephoned him, but he declined to come that night, and telephoned to the housekeeper to mix a bottle of medicine consisting of mag. sulph., 1 oz.; tinc. nux vom., 1 dr.; and water, 6 oz. Also one calomel pill was to be supplied. The next morning the patient was dead. The housekeeper's daughter, aged seventeen years, mixed the medicine in her mother's absence, and had done so before in the doctor's absence. A post-mortem showed death to be due to pneumonia, but another doctor said the medicine was not proper for that complaint. The coroner condemned the action of the doctor in prescribing without seeing the patient, and said: "for a girl of seventeen to act as a doctor's assistant was a very dangerous practice." Verdict, "Death from pneumonia," and the coroner consented to report the matter to the General Medical Council. Writing to the local Press, the doctor himself said: "It would be impossible for a country practitioner to carry on his profession if he could not employ unqualified dispensers—usually his wife or daughter."

More Accidents in Doctors' Surgeries.

14. January, 1899. Dr. —— was treating a patient for influenza. He gave his dispenser (a medical student, who said he had had twelve years' experience in dispensing medicines) a prescription and also verbal instructions to make a 4-oz. linctus of morphine, and then at the moment changed it into 8 oz. The dispenser was confused in consequence, and was not sure from the prescription and the verbal alteration which were to be taken. He understood the drachm and a half in the prescription to mean powdered morphine, and did not recollect the doctor saying it was to be liquor morphinæ. He worked out the prescription as well as his confused state would allow him. He weighed 50 grs. of morphine, and some gum acacia, and measured 8 drops of prussic acid, and mixed them together. The bottle was labelled "two tablespoonfuls," but he calculated the 50 grs. by always having dispensed teaspoon doses. It did not occur to him to calculate the amount of morphine in two tablespoonfuls. The coroner commented on the prescription as having been "made out in a most slipshod manner," and said "if the dispenser did not understand the prescription he had no right to make it up." The jury returned a verdict of "Death by misadventure," and the dispenser was censured.

15. June, 1899. Dr. —— administered to a man suffering under the influence of drink a draught containing chloral, 20 grs.; potassium bromide, 10 grs.; and morphine, between 1 to 2 grs. A post-mortem showed death from diseased condition of organs, accelerated by an overdose of morphine. The doctor admitted that he did not weigh the constituents of the draught. The jury returned a verdict according to the medical evidence, and added a rider: "And the jury consider the act of guessing the quantity of active poison most reprehensible."

16. September, 1899. Dr. —— dispensed, as he believed, tincture of steel, infusion of chiretta, and chloroform water. The lady patient became ill, and afterwards told the doctor that she strongly suspected that she had been poisoned. To convince her to the contrary, the doctor drank some of the medicine, became seriously ill, and died from strychnine poisoning. The medical evidence showed there had been a mistake (arising, it was suggested, by the proximity of the two bottles) in dispensing solution of strychnine for chloroform water.

Mistakes in Public Institutions.

1. December, 1902 (Workhouse). Nurse gave carbolic lotion in mistake for "house mixture." Inmate died. Suggestions for the storage and care of poisons ordered to be adopted in future.

2. June, 1901 (Asylum). Three persons died from the effects of an overdose of chloral. The mixture was to contain 30 grs. of chloral, but if, as was conjectured, the concentrated chloral was used it contained 240 grs. The senior assistant medical officer said that, to the best of his recollection, he had taken a bottle from the cupboard containing the poison and placed it on the bench in front of him, together with the bottle containing the diluted chloral. He had to use both kinds of chloral for separate medicines. He left the surgery for a few minutes, and on returning must have picked up the wrong bottle. The jury returned a verdict of "Misadventure," and added a rider that the bottles or contents should be coloured differently.

3. March, 1900 (Hospital). Nurse ordered to give a man a preparation of strychnine during the night if he became no better. She took from a chest a preparation of strychnine used for hypodermic injection instead of the ordinary solution. The patient died from an overdose. Verdict, "Misadventure."

4. April, 1899 (Hospital). 2 oz. of paraldehyde given in night

to restless patient instead of 1 dr. It was taken by a nurse from a bottle of pure paraldehyde, to which a label bearing instructions for a previous patient had been affixed by another nurse. The label was "1 dr. of paraldehyde, in 2 oz. of water." The nurse took this to mean that 2 oz. of this would be equivalent to 1 dr. of the drug. The verdict was "Misadventure, with an opinion that greater care should be exercised by doctor and nurses in the labelling of bottles and the dispensing of medicines."

5. December, 1899 (Hospital). Two patients fatally poisoned by strychnine, through liq. strych. being filled into spt. ether. nit. dispensing bottles. Three dispensers employed, all having a qualification. Verdict, "A misadventure, but in consequence of lax system which obtained in the dispensary, unable to fix the blame on any individual." Recommended that the poisons should be kept in differently-shaped bottles, and that the initials of the dispenser who last filled them should be shown on the bottles.

Dispensing Mistakes in Chemists' Shops.

1. July, 1903. Qualified assistant to a chemist gave solution of strychnine in mistake for solution of morphine to a man who was in the habit of taking morphine. The man died. Verdict, "Death from misadventure."

2. March, 1903. Assistant to chemist in dispensing a prescription for powders by mistake substituted strychnine for exalgin. A death followed, and the result of the assistant being tried for culpable homicide was a verdict of "Not guilty."

3. February, 1903. Chemist dispensed liquor ammon. fort. for sal volatile, in consequence of which a man met his death. Chemist himself prescribed the mixture for a cold. He was arrested and tried for manslaughter, and sentenced to fourteen days' imprisonment.

4. January, 1903. Drug stores dispensed a prescription for "2 calomel pills to be taken at bedtime," by supplying 24 pills inscribed "2 pills to be taken 3 times a day." 22 of the pills were taken. The prescription was said to be very indistinctly written. Damages of £150 were obtained. The assistant who dispensed was qualified.

5. July, 1902. Apprentice to chemist supplied laudanum for tincture of rhubarb. There was no doctor's prescription. A death resulted, and the jury returned a verdict of "Misadventure."

6. May, 1902. Assistant to chemist supplied strychnine on an order for morphine. A doctor took some and died.

7. August, 1901. Drug stores supplied methylated spirits for lime water. A dose, according to doctor's instructions, was given an infant, who died from syncope, due to a convulsive fit, consequent on an irritant. The bottle was "put up" on the manager's instructions by a boy. Verdict, "Death from misadventure."

8. June, 1901. Chemist supplied by mistake strychnine in a cough mixture which he prescribed for a child. He was tried at the assizes and liberated on his own recognizances. It was urged at the trial that at his great age (eighty-two) he did not appreciate the regulations to keep poisons apart from other drugs. An undertaking was given that he should not again go into business.

9. August, 1900. Assistant to chemist was applied to for "fluid magnesia," but after a dose had been given to a child it was discovered that the bottle contained "liquid ammonia." Medical evidence did not in any way attribute the death which followed to swallowing ammonia. A verdict that deceased died from diarrhœa and convulsions was returned.

10. October, 1899. Chemist dispensed a doctor's prescription for Mrs. A; the mixture was repeated. Then the medical man sent a few days afterwards a new prescription for a Mrs. A of a somewhat similar but not identical address. This was dispensed in the ordinary way. Next a "repeat mixture" was ordered for Mrs. A with the result that the first prescription ordered by the doctor was dispensed. Chemist thought he was dispensing for two Mrs. A's, but there was only one. The first medicine was for reducing fever, the second was a tonic. Verdict, "Death from milk fever, probably accelerated by the mistake in the medicine."

It will be observed that fatal results are reported in all the published accounts of mistakes in doctor's surgeries, and that in the list of mistakes in chemists' shops two cases without fatal results are included and one doubtful case. It should also be noted that in two of the fatal cases in chemists' shops the chemist combined the functions of both prescriber and dispenser.

Doctors not Competent to Dispense Medicines.

These published accounts speak for themselves. It may confidently be said: (1) That few doctors are competent by proper training to dispense. (2) That even if they were rendered more fit by education to discharge that function, the very nature of their other duties militates against that concentration of thought which the experience of pharmacists teaches is so essential in the practice of pharmacy. (3) That the separation of prescribing

from dispensing necessarily insures much greater care and thought by both the prescriber and dispenser, and, further, in each case one is a check on the other. (4) That it would be more satisfactory from a public point of view were doctors freed from the possibility of having mistakes to cover or answer for. This latter could be best obtained by separating pharmacy from medical practice altogether, or by insisting on doctors employing only qualified chemists in their surgeries, the doctors themselves not to be allowed to dispense. There is ample precedent for the former of these alternatives. In France, for instance, physicians are not allowed to sell medicines to their patients, or even keep a stock of specially-prepared medicines on hand for dispensation, except when the pharmacist of a locality refuses to make up a prescription according to the doctor's orders, and only then after duly stating his refusal, or again in cases where there is no pharmacy within a few miles of the doctor's residence. Although the doctor cannot, in principle, sell or retail medicines, he has the right to have them prepared in his presence by a pharmacist of his choice, and take the same himself to his sick patient. In Germany and Austria doctors cannot dispense medicines except where, as in sparsely-populated districts, the population is too small to support a pharmacist. According to the Dutch, Danish, Italian, and Spanish medical laws, the doctor prescribes the medicine and the apothecary prepares it. The doctors who establish themselves at places where no apothecary is established are authorized to furnish medicine. Without enumerating all countries where pharmacy cannot be conjointly practised by the medical profession, it may be mentioned that even in such a republic as the Argentine prescriptions can only be dispensed in pharmacies unless there is not one within reach of the medical man.

Dispensing as a Trade Matter.

It may be said that this is a trade agitation. It is as much a trade matter for the chemist who is specially trained for the purpose to have the dispensing of medicines as it is for the doctor to desire to participate in it. But, as a matter of fact, the question is one of considerable public importance, and complaint as to the deficiencies of the present system can only come from pharmacists initially, because to them is made known the manner in which the public suffer, or run the risk of suffering, through the combination of the functions of prescriber and dispenser. That the "trade" aspect of the question is not lost

sight of by a section of the profession is shown by a letter to the *British Medical Journal*, which also illustrates the manner in which the public suffer: "After many years of both dispensing and non-dispensing practices, I infinitely prefer the former. Double the income, with half the work, is the result of dispensing. If the practice exceeds £700 it is well to keep a dispenser, in my experience, and this can be done with little expense, even in smaller practices, by the aid of a pupil or lady dispenser who will also act as governess. I never found dispensing affect one's social position, though I certainly do think it is *infra dig.* to be seen mixing medicines.—Yours, etc., 'Common Sense.'" A better example is that furnished by letters read in an action brought by a *locum tenens* to recover fees due. The defendant doctor wrote to the plaintiff doctor: "The surgery, to pay expenses, must make at least £4 per week, so charge them more, and put in second bottles and plasters, ointments and lotions whenever you get the least chance. I thought I would give you another hint *re* the practice. When visiting a certain house I saw you gave a big 6-oz. bottle to a child five years old, and the dose marked on it was one teaspoonful three times a day. Now you will see at once that we should never make a fortune at that rate. There would be forty-eight teaspoonful doses in that bottle, costing 1*s*., and taking three every day, these would last for sixteen days. Kindly remedy this. Give to a child of that age ℥iss. bottle, charge 1*s*., and order a teaspoonful every two or three hours, so they may come back next day or the day after. The 6-oz. bottles are for adults, and order one tablespoonful dose at least four times a day."

Some Evils of Dispensing by Doctors.

Both the Council of the Pharmaceutical Society and the General Medical Council have been moved in this matter of doctors' dispensing. But before detailing the circumstances leading to these inquiries, it may be mentioned that the late Dr. D. J. Leech, the Chairman of the Pharmacopœia Committee of the General Medical Council, in addressing the School of Pharmacy of the Pharmaceutical Society, in 1899, said: "The practice of pharmacy by doctors is not only an evil to the pharmacist but to medical men themselves. It leads practitioners to limit themselves unduly to the use of certain drugs, and they lose time which might be devoted to other and more profitable matters. It is true there are also many people who like to have their

medicine from a doctor, but I believe medical men would gain if, whenever possible, they gave up dispensing, and there are few places in which there are not pharmacists ready to take up the work." At some of our medical schools the abolition of doctors' dispensing has been advocated, notably by Dr. Risien Russell, in an address to University College Hospital Medical School in 1901. The medical journals have also not been silent on the subject. The *British Medical Journal*, in an editorial in April, 1901, after referring to the prosecutions against medical practitioners in the West of Scotland, who left open shops away from their residences in charge of unqualified dispensers, says: "There is another abuse not so easily controlled . . . We allude to the employment of unqualified persons as dispensers at surgeries some distance away from the practitioner's residence. A case occurred not long ago" (see December, 1900, in above list) "in which a practitioner, having four of these surgeries connected with his house by telephone, telephoned to the woman in charge, an unqualified person, to make up a prescription containing, among other things, nux vomica, for a patient whom he had not seen. This was of course indefensible, and if it could be shown to be a common practice, would constitute an abuse for which, in the interests of the medical profession, the General Medical Council would be bound to find some remedy." Again the *Medical Press* said in May, 1899: "The General Medical Council has done its best to throw cold water on the outcry against the employment by medical practitioners of unqualified dispensers, and the Government is delighted to have an excuse for leaving these matters as they are. There is not much reason to suppose that such accidents are common, but it is impossible to gainsay the assertion that if they are frequent the public would not be likely to hear of them, seeing that it rests with the person who has most to lose from a scandal to get the dead past to bury its dead."

The Heaton Norris Fatality.

The "outcry" to which reference is made above was that which followed the Heaton Norris fatality in 1899. The subject was brought before the Privy Council, Parliament, the General Medical Council, and the Pharmaceutical Society. Mr. W. S. Glyn-Jones addressed a letter to the Privy Council, pointing out that the accident was as much due to the ignorance as the carelessness of the dispenser, and that although it might be said an

isolated case did not show that the practice was common, it was a wonder, in view of the death certificate, that any case became public. He suggested (in view of the then probable fresh poisons legislation) that if it was not expedient to prevent doctors dispensing, it should be easy to enact that the assistants employed should be qualified chemists or doctors. This letter was brought before the notice of the Pharmaceutical Council, and referred, with a suggestion from Mr. Glyn-Jones that an amendment of the Act should be sought, to the Law and Parliamentary Committee. Pertinent questions were asked by Major Rasch in the House of Commons, but only unsatisfactory replies were elicited. The Privy Council forwarded several communications to the General Medical Council, and a committee which was appointed to consider them issued a very weak and unsatisfactory report, but from this and other reports it will be seen that the General Medical Council will not countenance unqualified medical practice, regards as unprofessional conduct the employment of unqualified persons to sell poisons in doctors' open surgeries, but declines to interfere with the employment of unqualified persons in the private dispensaries of doctors. And the Pharmaceutical Society seems chary of interfering in view of the General Medical Council's action, or rather, inaction.

The Decay of Prescribing.

It has lately been emphasized in the medical press that the doctor is not now a capable prescriber. The *Lancet*, for instance, only in April last, observed that "owing to the methods of instruction adopted at the medical schools at the present day in relation to practical pharmacy it is not a matter of surprise that practitioners should sometimes go astray when writing prescriptions." And Mr. Donald McEwan, in a paper on "Limits of Discretion in Dispensing," having pointed out that the choice of a suitable pill excipient is frequently left by the doctor to the dispenser, the *Lancet* has acknowledged that this is "in consequence of the want of practical dispensing experience on the part of medical students." In an article in the *British Medical Journal* for January 10 of this year it is stated that: "To some of those who have experience in the examination of students for their qualification to practise there is no fact more striking than the extent to which inefficiency prevails in this elementary but most necessary accomplishment"; and this appears to be supported by the

practice of so many doctors ignoring the Pharmacopœia and ordering nostrums, proprietary preparations, and portable medicines selected from automatic prescribing price lists, with the result that the patients copy the example of the doctor and prescribe for themselves to such an extent as to be a grave public danger, and against the consequences of which chemists are frequently called upon to warn customers of probable serious results.

The Separation of Dispensing from Prescribing.

The importance of separating dispensing from prescribing was very vividly impressed on my mind during a short experience as dispenser to a surgeon in Wales. During the holiday of my employer a neighbouring practitioner acted as *locum tenens.* He came in about midnight one night, and asked me to put up a draught containing a drachm of laudanum. Thinking that he looked rather excited, I inquiringly mentioned the dose, and was measuring it very carefully when, appearing to be annoyed at my want of quickness, he took the laudanum bottle out of my hand, poured as near as I could guess about 3 drs. into a 1½ oz. phial, and made it up with camphor water. The patient who took that draught did not wake up the next morning, and the death certificate was in order. During my connection of over forty years with many chemists' shops, only one serious accident has been personally brought under my notice, and in that case there was fortunately, no serious inconvenience produced, and that was in a case where the chemist prescribed and dispensed the medicine, and the mistake would not have been possible with the present regulations as to the storage of poisons. This subject was referred to by Mr. Deane in his addresses at Bath and Birmingham in 1864 and 1865. Mr. Stephenson at Aberdeen in 1885, and Mr. Martin at Oxford in 1894, in an admirable address to this Conference, also referred to doctors' dispensing, pointing to the deep-rooted habit of the English people to expect the doctor to supply the medicine he has prescribed, and observing that any change can only come about by the slow process of educating the patients and by the exhibition of goodwill and feeling between medicine and pharmacy. He added: "Before it can happen universally, there is no doubt that pharmacy must have acquired such a professional standing and education as will enable it to perform its delicate and confidential function with the tact and reserve which is the outcome of prolonged training." I have only quoted the opinions of doctors who defend the practice of dispens-

ing; I could easily quote much more weighty opinions from medical men of higher ideals, who realize that the methods pursued in the surgeries of doctors who do their own dispensing are injurious to the elevation of the medical profession. As it is perfectly well known that nearly the whole of the best and most eminent men in the profession carefully avoid having anything to do with dispensing, it is not necessary for me to quote their opinions. I believe that the separation of medicine and pharmacy is proceeding, but the progress is very slow. I venture to hope that my humble contribution to the subject will promote the objects that we have in view—greater respect for the noble profession of healing, greater usefulness of the pharmacist, and, above all, greater safety of the public. Let all our aims be with a view to being of service to others, satisfied that the reward to ourselves will be in proportion as we do good work.

Mr. S. R. Atkins said: There are some privileges attaching to old age. I have one senior brother, and he is not present: that is Dr. Attfield. If he had been present it would have fallen to his lot to do what now falls to my lot, and would have deprived me of the pleasure of thanking Mr. Idris for his very thoughtful address this morning. I am not going to attempt to discuss that address. I would give you the old formula—"Read, mark, learn and inwardly digest." I will not attempt to indicate the points of the address. I rather want to refer for one moment to the man who has prepared it—your President. Mr. Idris has long been known to us as a man of affairs, a man of business, a man who means business, a man who transacts business. We English people—I will not say anything about the Scotch; they can take care of themselves—will have to take care of ourselves if the Principality is going to walk over us at the pace it is doing now. We are extremely pleased to meet the President and to know him more intimately as our friend and co-worker; and if he thinks proper at any time in his business life to find his way into the House of Commons where Welshmen are conquering antagonism, and whatever may be the subject of their eloquence and oratory, they are sweeping the board largely in the way in which they are influencing public opinion—if our friend thinks proper at any time to represent a constituency in the House of Commons, that constituency will be honoured by his return; and I am certain of this—that pharmacy will have an eloquent exponent of its principles and work. I need say no more, except to propose that, if

we have degrees of thanks (and I suppose we have—the positive, comparative, superlative), we give the superlatively best we can offer our friend.

Mr. J. W. WHITE, Clifton, seconded the motion, which was carried with acclamation.

The PRESIDENT acknowledged it by saying: I have tried to point out the possibilities of pharmacy; and in connection with my calling I have a very deep desire, a very deep love for any and every opportunity of trying to forward its interests. Before I go further, I ask you to thank Mr. James Baker, of Clifton, for giving to every member of the Conference a guide-book. (Applause.) It contains interesting articles by Professor Lloyd Morgan, Mr. J. W. White, Mr. C. Wilson and others.

LETTERS OF APOLOGY FOR ABSENCE.

Mr. F. RANSOM stated that letters of apology for absence had been received from the following:—

Professor Attfield, Messrs. Chas. Umney, N. H. Martin, J. C. C. Payne, J. L. Ewing, W. G. Cross, E. H. Farr, R. A. Cripps, H. Gadd, J. C. McWalter, C. T. Tyrer, J. H. Wardleworth and Peter Boa.

The letter of Professor Attfield, which contained matter of great importance, in relation to the origin of the British Pharmaceutical Conference, was read and excited much interest.

BRISTOL AND THE BIRTH OF THE B.P.C.

To the President of the British Pharmaceutical Conference.

Dear Mr. Idris,—It will interest both residents and visitors attending the sessions of the British Pharmaceutical Conference at Bristol this year to learn the exact circumstances of the connection of that city with the foundation of the Conference at Newcastle-upon-Tyne in 1863. In the *Pharmaceutical Journal* for May, 1863, page 506, Mr. Richard Reynolds suggested that pharmacists should at the time of the meeting of the British Association at Newcastle in the following August confer as to the best mode of promoting "Systematic Scientific Inquiry." In the *Journal* for June, page 562, Mr. Henry B. Brady supported Mr. Reynolds, and on page 563 appeared a letter from Mr. George Frederick Schacht, referring to his suggestion of "several years ago" that "the annual meetings of the Pharmaceutical Society should be held not always in one fixed place, but in rotation at the various towns of

importance where its members resided." In that letter he again urged the adoption of this course. On neither occasion, however, did his views meet with concurrence so far as an annual provincial meeting of the Pharmaceutical Society was concerned, but considerable approval was expressed in 1863 respecting an annual provincial gathering of pharmacists generally; and I may say at once that thereupon Messrs. Reynolds and Brady urged the present writer to join them in starting such a body, and that as a result of a circular we issued, on July 21, 1863, fifty prominent pharmacists, including Mr. Schacht, expressed their cordial approval of the scheme, and the present British Pharmaceutical Conference was founded at Newcastle-upon-Tyne on September 2, 1863.

But my present object concerns the connection of Bristol with the birth of the Conference. Until a week or two ago I had been unable to trace any report of the occasion on which Mr. Schacht had urged the holding of provincial gatherings of pharmacists from all parts of the country. He himself was once asked respecting this point, but could not recall the time or place. Recently I searched the early volumes of the *Pharmaceutical Journal* and in the monthly number for September, 1852, page 123, I found the missing link. It is contained in a report of "A Meeting of the Chemists and Druggists of Bristol and Clifton, held at the rooms of the Fine Arts Academy, on the Drawbridge, on Monday evening, August 9, 1852, when Mr. Jacob Bell attended to explain the provisions of the Pharmacy Act." I cannot do better than transcribe the remarks which bear on the subject to which attention is now drawn.

"Mr. SCHACHT said he was anxious to take the present opportunity, which he thought was an occasion favourable for any expression of opinion upon affairs connected with the Society, to suggest the establishment of annual meetings for scientific objects connected with pharmacy which should circulate through the chief towns in the provinces, somewhat upon the model of the Provincial Medical Association. He thought that meetings of this character held annually in different localities would have the effect of stimulating the provincial members to a more active co-operation, and that they might often be made highly instructive, by selecting as the place of meeting towns which presented peculiar objects of manufacturing interest. He thought, further, that it would be more easy to keep alive the spirit of assemblies of this variable description, as, in addition to the attractions which the several districts might present, there would be some local pride to

influence the residents in each neighbourhood to support the character of the meeting in which they were most immediately concerned. It was well known that this feeling was strongly entertained in the various towns in which meetings of the British Association and other societies had been held.

"Mr. BELL approved the suggestion of the provincial scientific meetings, and felt sure that the council would give it their best consideration.

"Mr. R. W. GILES agreed in expecting great benefit from the adoption of Mr. Schacht's suggestion, which he thought would foster a scientific taste in the followers of pharmacy. He thought it no inconsiderable merit in the scheme that it would afford a legitimate opportunity of combining technical improvement with that bodily relaxation which close attention to an exacting occupation restrained to an injurious degree, and he was glad to find that it would have Mr. Bell's support with the Council."

It will be seen that in these extracts from speeches thus delivered at Bristol fifty-one years ago were laid down the principles of (*a*) the fostering of pharmaceutical research and (*b*) the promotion of friendly intercourse amongst pharmacists, which form the two objects of the organization termed "British Pharmaceutical Conference," whose members now assemble for the second time at Bristol forty years after its foundation at Newcastle in 1863.

Personally, I much regret to be absent from the gathering, but at the time and for a few weeks afterwards I shall be in the hands of a well-known surgeon who promises such results as will enable me to attend meetings of the Conference for years to come.

Yours faithfully,

JOHN ATTFIELD.

WATFORD, HERTS, *July* 22, 1903.

VOTE OF CONDOLENCE.

The PRESIDENT said there was one gentleman—a very good friend of the Conference—who was absent through circumstances in which all sympathized. Mr. N. H. Martin, of Newcastle, had suffered a severe loss, and the Conference had not only lost the presence of Mr. Martin this year, but it would feel the permanent absence of Mrs. Martin. In these circumstances he felt that the Conference would wish to express its sympathy with Mr. Martin in his grief.

The sympathy of the Conference was expressed by each member rising.

RECEPTION OF DELEGATES TO THE CONFERENCE.

Mr. RANSOM then read the list of delegates, as follows:—

Pharmaceutical Society of Great Britain.—President, Vice-President, Messrs. Cross, Glyn-Jones, Newsholme, Wootton, Gifford, Symes, Cooper.

Pharmaceutical Society (North British Branch).—Messrs. David B. Dott (Chairman), Thos. Dunlop (Vice-Chairman), W. B. Cowie, W. Cummings, W. Giles, C. Kerr, T. Maben, A. Naysmith.

Pharmaceutical Society of Ireland.—Mr. G. D. Beggs (President) Mr. Johnston-Montgomery (Vice-President), Messrs. John Smith, Patrick Kelly, W. F. Wells.

Belfast Chemists' and Druggists' Society of Ireland.—Mr. W. J. Gibson.

Bradford and District Chemists' Association.—Messrs. Arthur Hanson, R. W. Silson.

Brighton Association of Pharmacy.—Messrs. Savage and Yates.

Cambridge Pharmaceutical Association.—Messrs. E. H. Church and E. S. Peck.

Dover Chemists' Association.—Mr. R. M. Ewell.

Edinburgh Chemists' Assistants' and Apprentices' Association.—Messrs. W. B. Cowie, Wm. Duncan, J. Rutherford Hill.

Exeter Association of Chemists and Druggists.—Messrs. F. W. Vinden, Henry Gadd, J. H. Lake, T. Tickle, P. F. Rowsell, T. C. Milton, and H. Wippell Gadd.

Forfarshire and District Chemists' Association.—Messrs. A. B. Anderson, Chas. Kerr, Jas. Russell, Wm. Cummings, A. Naysmith, J. H. Thomson.

Glasgow and West of Scotland Pharmaceutical Association.—Messrs. W. L. Currie (President), R. Brodie (Vice-President), J. Foster, J. McMillan, G. Robertson, T. Maben.

Grimsby and District Chemists' and Druggists' Association.—C. Willson (Vice-President), and H. W. Colley (Secretary).

Leeds and District Chemists' Association.—Messrs. F. W. Branson (President), and F. Pilkington Sergeant.

Liverpool Chemists' Association.—Messrs. R. C. Cowley, Edward Evans, junr., H. Evans, John Alexander, Prosper H. Marsden, J. Shacklady, Dr. C. Symes.

London Chemists' Association.—Messrs. P. B. Betty, A. Cooper, W. S. Glyn-Jones, R. H. Jones, W. Watson-Will, F. W. Freeman.

London Western Chemists' Association.—Messrs. J. W. Bowen (President), Frank A. Rogers (Vice-President), W. Prior Robinson.

London Chemists' Assistants' Association.—Messrs. C. J. Strother, W. Garsed

Manchester Pharmaceutical Association.—Messrs. C. A. Johnstone, Pidd, Kemp, and Wild.

Midland Pharmaceutical Association.—Messrs. A. W. Gerrard and F. H. Alcock.

Newcastle-on-Tyne and District Chemists' Association.—Messrs. G. F. Merson, Geo. Foggan, T. Maltby Clague, F. Gilderdale.

North Kent and District Chemists' Association.—Messrs. A. Goldthorpe, D. V. Still, R. Feaver Clarke.

Oxford and District Chemists' Association.—Mr. G. C. Druce (President), Mr. H. Mathews.

Plymouth, Devonport, Stonehouse and District Chemists' Association.—Messrs. J. Davy Turney, W. Herbert Woods.

Sheffield Pharmaceutical and Chemical Society.—Messrs. G. T. W. Newsholme, G. Squire, A. R. Fox, H. Antcliffe, F. A. Upsher Smith.

Tunbridge Wells and District Chemists' Association.—Mr. A. E. Hobbs.

Report of the Executive Committee.

Mr. Peck presented the following report:—

During the past year the Executive Committee has met in London on several different occasions. It has to report with profound regret the removal by death of several old and well-valued members of the Conference, both at home and abroad—no less than seventeen in all. Amongst the number special mention must be made of F. Baden Benger, who presided at Bath in 1888 with such marked success, and who filled the office of honorary secretary from 1871–1884. His unfailing courtesy and kindliness of manner endeared him to all those with whom he came in contact, and his devotion to the interests of the Conference while in office contributed largely to its success. The death of John Moss, who held the post of Treasurer for five years, and whose contributions of papers were always of great practical value, is also a serious loss. Amongst other distinguished members who have passed away must be recorded the names of C. R. Blackett, President of the Pharmacy Board of Melbourne; H. Collier, formerly an energetic member of the Executive, and frequent contributor of papers; and G. H. Grindley, of Dublin, who filled the office of Auditor. Twenty members have resigned, and over fifty have been elected as new members. The Research List has again been thoroughly revised, and, through the kindness of the editors of the various journals connected with pharmacy, has been well circulated. The

Executive wish to take this opportunity of thanking those members who are working out these subjects, and wish also to invite suggestions for new items and offers from those willing to undertake the work. Two grants from the Research Fund have been made, and the results of the work done will be communicated to this meeting. Mr. W. W. S. Nicholls will report upon "Ferri Arsenas, P.B.," and Mr. E. W. Pollard upon "A Spurious Cusparia Bark." It has been considered by many that the time has arrived when a General Index of the *Year-Books of Pharmacy*, from 1886–1903, should be compiled. Careful inquiries as to cost of production have been made, and a circular issued to each member upon the subject. The Executive wishes to draw special attention to this, and to express the hope that the response given will be sufficient to warrant them in undertaking the work. It is with sincere regret that the Executive learns that Mr. F. Ransom feels compelled, by reason of increasing business engagements, to retire from the Secretaryship—a post which he has held for so many years with such marked ability, courtesy, and tact. The secretaries have, during the past year, endeavoured to promote increasing interest in the Conference amongst our Colonial friends, and Mr. G. W. T. Rich, of Brisbane, has kindly consented to act as Colonial Secretary for Queensland. The Executive believes that there is considerable evidence of an increasing desire on the part of pharmacists generally to form a bond of union amongst themselves, and the various associations established for the advancement of pharmacy throughout the Empire, and ventures to suggest that one of the best means of attaining this object is to largely increase the membership of the Conference, and trusts that in the coming year more pharmacists both at home and abroad may avail themselves of the advantages to be gained thereby. Mr. J. O. Braithwaite remains as Editor of the *Year-Book*, and has placed in the hands of the printers the MSS. of parts i. to iv. The Executive has entered into a fresh arrangement with the printers, whereby it is hoped that the *Year-Book* will be issued somewhat earlier this year. The Assistant-Secretary, Mr. J. Hearn, still continues to carry on his part of the work with interest and care.

The Financial Statement.

Mr. J. C. Umney (Treasurer) then presented the financial statement. He commented on the success of the Dundee meeting last year, and announced that their Dundee friends had been able to substantially help the Conference to the extent of £15. He hoped that another year the Conference would be quite out of debt.

Financial Statement for the Year ending June 30, 1903.

1902.	Dr.	£	s.	d.	£	s.	d.
July 1.	To Assets, forward from last year :—						
	„ Cash at Bank				5	19	8
1903.							
June 30.	„ Members' Subscriptions				393	1	0
	„ Dundee Subscription (Balance of Fund)				15	0	0
	„ Sale of *Year-Book* by Publisher	13	6	8			
	„ „ „ „ Secretary	2	0	0			
					15	6	8
	„ Advertisements in *Year-Book*	67	1	8	67	1	8
	„ Sales of Formulary	3	0	0	3	0	0
	„ Liabilities—on open Accounts:						
	Butler & Tanner	133	13	2			
	McCorquodale & Co.	2	16	0			
	Due Assistant-Secretary for Salary and Rent to date	13	15	0			
	W. Carling & Co.	0	18	6			
					151	2	8
	„ Bank allowance on P. Order unclaimed				0	0	3
	„ Bell and Hills Fund				27	17	10
					£678	9	9

1902.	Cr.	£	s.	d.	£	s.	d.
July 1.	By Bell & Hills Fund, forward from last year				27	18	8
1903.							
June 30.	By Expenses of *Year-Book*, 1902 :—						
	Printing, Publishing and Binding	200	10	8			
	Banding and Parcelling	3	2	6			
	Postage and Distributing	16	9	2			
	Advertising 25*s.* 6*d.*, Publisher's Charges £1 and Commission on Sale £16 15*s.* 5*d.*	18	1	11			
	Editor's Salary	100	0	0			
					338	4	3
	„ Expenses of Formulary :—						
	Commission on Sale by Publishers	0	6	0			
					0	6	0
	„ Sundry Expenses :—						
	J. P. Mathew & Co., Dundee Programmes	1	5	6			
	Assistant Secretary Annual General Meeting	10	0	0			
					11	5	6
	Assistant - Secretary Salary for 1 year to date	45	0	0			
	Rent of Office for 1 year to date	10	0	0			
					55	0	0

1903.	Cr.	£	s.	d.	£	s.	d.
June 30.	By Postages £14 1s. 8d., Editor 14s. 4d . . .				14	16	0
	„ Printing and Stationery:—						
	McCorquodale	5	5	0			
	Editor	0	6	5			
	W. Carling & Co.	0	18	6			
					6	9	11
	„ Petty Cash				12	0	1
	„ Foreign Journals for Editor				5	2	0
	„ Bank Charges	0	1	4			
	Extra Poundage, 1d., 1d. .	0	0	2			
					0	1	6
	„ Liabilities of last year, since paid:—						
	Butler & Tanner	34	15	4			
	Assistant Secretary, Salary .	13	15	0			
	Postage and Petty Cash .	6	18	0			
					55	8	4
	Assets J. & A. Churchill—open a/c	65	0	5	65	0	5
	By Balance at Bank	83	17	2			
	Less unpresented cheque . .	14	19	8			
					68	17	6
	Petty Cash:—						
	Cash in Secretary's hands				12	19	7
					£673	9	9

The Bell and Hills Fund.

1902.		£	s.	d.	£	s.	d.
July 1.	To Balance from last year . .	27	18	8			
	For one Year's Dividend on Consols	9	5	8			
					37	4	4
Aug. 1.	By Henry Kimpton a/c for Books				9	6	6
					£27	17	10
	„ Assets:— In account with British Pharmaceutical Conference £360 2½% Consolidated Stock						

The British Pharmaceutical Conference Research Fund.

1902.		£	s.	d.	£	s.	d.
July 1.	To Balance	47	5	0			
Dec. 30.	Cr. by Wm. W. S. Nicholls, Brockley				2	0	0
1903.							
Apr. 28.	Cr. Evelyn Wm. Pollard, Ryde I/W . .				2	0	0
	By Balance				43	5	0
		£47	5	0	47	5	0
	To Balance	£43	5	0			

Examined and found correct,

July 13, 1903.

J. W. BOWEN,
W. PRIOR ROBINSON } Auditors.

Dr. SYMES moved that the Report of the Executive Committee and Treasurer's statement should be received and adopted. He said that the report was an exceedingly satisfactory one. It looked as if the Conference was not only holding its own, but was making decided progress. They had added a goodly number of members, not only at home, but members, in the wider sense, of the whole Empire. As to the finances, they were getting now on a satisfactory basis. Not so many years ago he suggested to the Executive that they should increase the subscription, and he felt sure that if that was necessary the money would be readily forthcoming. But there was a feeling—and no doubt it was right—that it was better to leave the matter as it stood and look to some other means to increase their numbers rather than advance the subscriptions in order to place them in an improved financial position; and he hoped that every member felt it incumbent on him to try and secure fresh members. He regretted that the Conference was about to lose the services of Mr. Ransom, one of the Honorary General Secretaries.

Mr. G. D. BEGGS (President of the Pharmaceutical Society of Ireland) seconded the motion. He said it was a matter of considerable interest that the Conference was extending its borders in the Colonies; and he was sure that the Colonies would take up the good work that the Conference was doing at home. They very much regretted that they were to lose the valuable and esteemed services of Mr. Ransom. Although they had suffered the loss of twenty members, there were fifty additions, so that there was a net gain of thirty.

Mr. G. C. DRUCE also supported the motion. Referring to the Dundee meeting, he mentioned the steps that had been taken to erect a memorial to George Don, the Forfarshire botanist. He said that from the initiatory step taken by the Dundee Association they had been successful in arranging to put up a monument to the old Scottish botanist in his native town of Forfar. They hoped to have it completed before the end of the year; it would be an appropriate testimony to a worthy man, and it would not do any harm to pharmacy and the Conference when it was known that its members went out of their way to honour a man not one of themselves, but a well-known botanist, and this was a happy feature of the Dundee meeting.

Mr. Victor Say (Victoria) was asked to offer a few remarks as representing the Colonies. He thanked the Conference for the cordial greeting extended to him, and said that he had great pleasure in being amongst them.

The resolution was adopted.

Report of the Formulary Committee.

Mr. F. C. J. Bird, in the absence of Mr. N. H. Martin, presented the following report :—

Since the last annual meeting of the Conference the Formulary Committee has held two meetings, at the first of which Mr. N. H. Martin was unanimously re-elected Chairman, and Mr. F. C. J. Bird was elected Secretary, in the place of Mr. W. A. H. Naylor, who felt unable to continue to perform the onerous duties of the position. The Committee cannot too strongly emphasize the debt of gratitude which the Conference owes to Mr. Naylor for having rendered to the Formulary Committee such valuable assistance as Honorary Secretary from the time that it was first appointed, in 1886, and the vote of thanks which was accorded to him was heartily endorsed by every member. At this meeting a number of formulæ were considered, and suggestions were made for new preparations to be added to the Formulary. Lists of these were subsequently distributed to the several members of the Committee, who experimented on the formulæ and processes which had been suggested. At the second meeting, held in March, 1903, many samples of the above preparations were examined and discussed, and certain formulæ were accepted as complete. Others were referred to the members for further experiment, and an additional list of preparations for inclusion in the next edition of the Formulary was agreed upon, which list was afterwards sent to the various members who had undertaken to work out the details for suitable formulæ.

The Committee would again call the attention of the members of the Conference and of all dispensing chemists to the appeal which was made in the report for 1901 (*Year-Book*, page 332), and again in 1902 (*Year-Book*, page 376), which appeal was repeated by letters to the pharmaceutical journals after the first meeting of the Formulary Committee in October, 1902, but up to the present no response has been received to these appeals.

Chemists throughout the country must frequently be dispensing prescriptions in which preparations of "particular makers" are specified, for the simple reason that no such preparation is in the British Pharmacopœia or in the B.P.C. Formulary. It is disheartening to the members of the Formulary Committee not to receive more assistance in the compilation of a list of substances which are in actual use from those who alone can furnish the information. The Formulary Committee fear that many members of the Conference do not sufficiently bear in mind the terms of the resolution under which the Committee was appointed in 1886, and which reads as follows:—

"That in order to secure greater uniformity in composition and strength in non-official remedies, and also to enable the medical profession to prescribe them with definite knowledge of those qualities, and without indicating any particular maker, the Conference undertakes the preparation of a Formulary of Non-Official Remedies" (*Year-Book*, **1886**, 494).

The copies of the last edition of the Formulary are fast diminishing, and if the Committee is re-appointed, it is desirable that it should be in a position to go to press with a new edition during the coming year.

The report was adopted.

Report on the International Congress of Applied Chemistry.

Dr. F. B. Power, who had attended the Congress as the Delegate of the British Pharmaceutical Conference, presented the following report:—

To the Honorary Secretaries of the British Pharmaceutical Conference.

Dear Sirs,—Having had the honour of being appointed to officially represent the Conference at the Fifth International Congress of Applied Chemistry, held at Berlin, June 2 to 8, I beg to present the following brief report. The Congress was opened on the evening of June 2 by a general session held in the large hall of the Reichstag building. The attendance was unprecedentedly large, having been estimated at about 2,500 to 2,800, and there was a larger proportion than usual of English chemists. The business of the Congress consisted chiefly in the reading of

scientific papers, which were divided among eleven sections, representing the different branches of applied chemistry. Among these, section 8 was devoted to medical and pharmaceutical chemistry, hygiene, and the chemistry of alimentary products, and its president was Dr. E. A. Merck, of Darmstadt. On account of the diversity of subjects comprised by this section it was found necessary to divide it into two sub-sections, and of these the one restricted to the consideration of subjects relating more or less directly to pharmacy was presided over by Professor H. Thoms. As it is customary on such occasions to appoint various members of the respective sections to preside in turn over the sectional meetings, by virtue of the compliment thus bestowed on foreign members, the chair was occupied during one of the sessions by your delegate, and on the following day by Mr. Peter MacEwan. This occasion afforded me the opportunity of presenting the official greetings of the British Pharmaceutical Conference, as a representative organization of British pharmacy, which were most cordially received. The meetings of the section devoted more specially to pharmacy were well attended, and a number of papers were communicated, but as these, together with many other details of the Congress as a whole, have already received more or less extended notice in the various journals, they need not be enumerated or further referred to here. The programme of the Congress was, in its entirety, an elaborate one, and included many social functions of a high order, as well as the opportunity of visiting many scientific and technical institutions of note, and other places of interest. In considering the results of such gatherings it may safely be concluded that, while many of the scientific papers presented are of permanent and substantial value, one of the by-no-means least important benefits accruing therefrom is the opportunity which they afford for the renewal of old friendships, or for forming anew the personal acquaintance of those of different nationalities who are engaged in similar studies or pursuits, and are animated by the same desire for the promotion of science. Similar advantages are certainly to be derived from the less pretentious, though none the less enjoyable, annual meetings of our own Conference. At the close of the Congress invitations were extended by the representatives of societies in London and in Rome to hold the next meeting in one of the respective cities. A vote of the members resulted, by a small majority, in favour of Rome, and the Sixth Congress of Applied Chemistry is, therefore, expected to convene in the latter city in

1906. It is to be hoped that it will be crowned with as large a measure of success as has attended the recent meeting in the metropolis of the German Empire.

Very respectfully,

FREDERICK B. POWER.

A vote of thanks was accorded to Dr. Power for his report.

The reading of papers communicated to the Conference was then proceeded with. The first paper read was on

THE PREPARATION OF ABSOLUTE ALCOHOL FROM STRONG SPIRIT.

BY PROF. SYDNEY YOUNG, D.Sc., F.R.S.

It is well known that the strongest spirit obtainable by distillation with the most perfect still-head contains less than 96 per cent. by weight of pure alcohol.

In order to remove the remainder of the water, dehydrating agents have always been used, but they do not give very satisfactory results. According to Mendeléeff, freshly-ignited lime is the only one by means of which pure dry alcohol can be prepared from strong spirit, and, even with this substance, special precautions must be taken to ensure success. More recently, Squibb obtained alcohol of lower specific gravity than Mendeléeff by the long-continued action of lime in a percolator, but his results, unlike those of the great Russian chemist, were somewhat variable, and there is very little doubt that a small amount of ether was formed.

The new method of dehydration depends on the following facts:—When a mixture of alcohol, benzene, and water is distilled, separation tends to take place into—

1. A ternary mixture of alcohol, benzene and water, which boils constantly at 64°85.

2. A binary mixture of two of the three original components.

3. That pure component which was in excess.

The boiling points of all possible components separable by distillation, and the percentage composition of the mixtures of constant boiling point are tabulated below. (A. = alcohol; B. = benzene; W. = water.)

	Boiling Point.	Percentage Composition. A	B.	W.
A.B.W.	64·85	18·5	74·1	7·4
A.B.	68·25	32·4	67·6	—
B.W.	69·25	—	91·2	8·8
A.W.	78·15	95·6	—	4·4
A.	78·3	100	—	—
B.	80·2	—	100	—
W.	100·0	—	—	100

When a mixture of equal weights of, say, 94 per cent. alcohol and benzene is distilled through a very efficient still-head, the components which can be separated by fractional distillation are: (1) the ternary A. B. W. mixture, containing, theoretically, the whole of the water; (2) the binary A. B. mixture, containing the remainder of the benzene; (3) pure alcohol. We thus get the remarkable result that the least volatile of the original components—water—comes over in the first part of the distillate, while the most volatile component, alcohol, remains until the last.

Benzene and dilute alcohol are easily recovered from the ternary mixture by treatment with water; and, by distillation of the dilute alcohol, strong spirit may again be obtained.

The binary mixture may be treated in the same way, or it may be added to a further quantity of strong spirit when it is to be dehydrated.

There is practically no loss either of alcohol or of the dehydrating agent, benzene; and, since no chemical action can take place between the substances present, there is no fear of impurities being introduced. Theoretically, a single distillation should be sufficient to remove the whole of the water; but the separation is a difficult one, on account of the small difference between the boiling points of the ternary and binary mixtures, and even with a very efficient still-head, a second, or possibly a third, distillation with benzene is necessary. The water may thus be completely eliminated; but there appears to be a minute trace of benzene left in the alcohol, too small to be detected by any chemical process. This may be completely removed, if necessary, by distilling the dehydrated alcohol with normal hexane; the binary hexane-alcohol mixture, which comes over first, carries the benzene with it, and no hexane is left in the residual alcohol.

The specific gravity of the alcohol, dehydrated in this manner, agrees very well indeed with that observed by Mendeléeff, as will be seen from the table below:—

Observer.	Dehydrating Agent.	Specific Gravity at 0°/4°.
Mendeléeff . . .	Lime	0·80625
Young	Benzene	0·80634
Young	Benzene and Hexane . .	0·80627

In order to obtain satisfactory results the benzene must be pure, and it is absolutely necessary to employ a very efficient still-head.

Mr. Thomas Tyrer (London) said they were very much indebted to Professor Young for the demonstration he had given, and particularly for his references to the actual apparatus. Some of those present might be amused by Professor Young's description of the delicate apparatus shown as "still heads." Nevertheless, they were so, and that it was a correct term might be illustrated by the fact that such small scientific apparatus for research might ultimately and indeed had become the models for the comparatively complicated apparatus used for the application of the scientific principles by which similar results were obtained on a commercial scale. Mr. Tyrer recalled the careful experiments made by Dr. Squibb, and said it was interesting to have seen the very work that Squibb had been engaged on. He also referred to Professor Young's paper read before the Chemical Society, relating to methyl alcohol and the removal of mixed water. That paper struck him so much that he proceeded to make a series of experiments. It was well known how difficult it was to purify methyl alcohol on a large scale, and a good deal of trouble had been caused by the demand for pure methyl alcohol for standardization purposes, and he wished publicly to express his very great thanks to Professor Young for the suggestiveness of the observations then made in his paper.

The thanks of the meeting were then given to Professor Young for his paper and demonstration.

Professor Young said he was interested to hear the remarks of Mr. Tyrer concerning Dr. Squibb. He believed the results of Dr. Squibb were due to the extreme carefulness of his experiments, in that he got the lime to act chemically on the alcohol, forming a little ether.

Mr. TYRER said Dr. Squibb had a lady assistant who rendered him excellent help, and he recollected when he was speaking to Dr. Squibb about the matter under consideration, she remarked, "You know we found ether."

ON THE NEW PHARMACEUTICAL INSTITUTE OF THE UNIVERSITY OF BERLIN,

BY PROF. H. THOMS, PH. D.; COMMUNICATED, WITH LANTERN SLIDES, BY PETER MACEWAN, F.C.S.

THIS communication, made through Mr. Peter MacEwan, consisted of a series of forty lantern slides illustrating the exterior and interior of the Institute, and notes descriptive of each slide. The Institute is the Pharmaceutical Department of the University of Berlin, and is situated at Dahlem, about five miles from the Capital. It was opened in October, 1902, and is devoted to giving students of pharmacy who are proceeding to the State examinations instruction in pharmaceutical subjects while they continue to get the more scientific courses, such as those in chemistry by Professor Emil Fischer, at the Chemical Institute in Charlottenburg, or in the other departments of the University. Professor Thoms is the director of the Institute.

The main building of the Institute has three floors, with a small upper fourth floor in the centre, forming an imposing structure of red brick, relieved with grey limestone facings. In the equipment of the Institute every advantage has been taken of the latest improvements for teaching chemistry and the technical sciences. In the manufacturing department there are a still for essential oils, machine-presses, apparatus for the mechanical division of drugs, vacuum-evaporators, centrifugal separators driven by electricity, and innumerable other modern appliances of the greatest service in tuition and research. The artificial lighting of the buildings is by electricity, whilst ventilation and heating are effected by air which is continuously forced through the laboratories and keeps them free from obnoxious gases. Constant water-pressure is obtained by automatic hydraulic pumps, which keep the pressure at four atmospheres.

The building contains a large lecture-hall with 240 seats, and a smaller one with 70 seats. In the largest laboratories there are benches for 150 students working at one time. There are other smaller laboratories for special work, including one for electrical investigations and another for experiments with toxic substances. The building also contains a large library, a collection of drugs and their adulterants, and a collection of food-adulterants. There are five balance-rooms, a special room for volumetric work, one for operations with hydrogen, one for chlorinating, and a dark-room for photography.

The lantern slides depicted most of these. They commenced with several views showing the approach to the Institute through the Botanic Gardens, in which flora native to nine geological formations are represented. In succession views were shown of the front of the Institute and the various departments within, consisting of the director's private laboratory, the laboratories for organic, qualitative, and toxicological chemical work, weighing-rooms and dark-rooms on the first floor. The largest laboratory of the Institute is situated on the second floor and accommodates 72 workers. Other slides showed the equipment of the machinery-room, a manufacturing-room where all the processes for the production of galenicals are conducted on a fairly large scale, the apparatus consisting of grinding and sifting machinery, steam-pans, vacuum-apparatus, and stills; and in contrast to these a series of slides were shown which depicted old-time distilling apparatus reproduced from Peter's well-known historical work. The slides were an object lesson in the thoroughness with which educational matters are gone into in Germany.

Dr. Power (London) said he had had the pleasure of visiting the institute at Berlin with Mr. MacEwan, and it was a delight to see the very admirable and beautiful equipment of that institution. It might certainly be regarded as the best that now exists in Germany or in any other country.

Dr. Symes (Liverpool) said it struck him that carefully distilled water did not usually require to be purified, and even if it did he should hardly have thought that sand and coke were suitable for filtration purposes, but would rather contaminate the water. He would like to ask if Mr. MacEwan had made any inquiries in regard to that point.

Mr. MacEwan said the sand and coke were carefully washed before the distilled water was passed through. It was very rarely that distilled water could be got free from ammonia, and, by passing it through the sand and coke, the ammonia was removed.

The President said he had not found it necessary to filter distilled water. There might be a little ammonia in distilled water, which would, of course, be occluded by filtration. He had found that if perfectly pure water was not used to start with there might be a certain amount of organic matter, and an oily, tarry odour about it. In regard to the use of coke he should have thought that animal charcoal would have been better. He had always found that if there was free ammonia present in distilled water it could be got rid of by having the water well boiled.

Mr. Tyrer said he should like to refer to something that the late Mr. Martindale said in connection with the matter under notice. When Dr. W. H. Martindale was finishing his education at Marburg his father went to see the pharmacological institute there, and though the building was ancient and cramped for room he found that the apparatus was most complete, and he (Mr. Tyrer) knew that Mr. Martindale said he thought that similar apparatus should be provided at 17, Bloomsbury Square. The fact that the President of the Pharmaceutical Society was present reminded him of that desire of Mr. Martindale's, and he thought that if something could be done to carry out that desire it would be a fitting memorial to Mr. Martindale as well as a good thing for the School.

Dr. Symes supported the suggestion made by Mr. Tyrer. Ten years ago he advocated the establishment of a practical laboratory at 17, Bloomsbury Square, where real pharmaceutical work could be carried out. When the Research Laboratory was instituted he urged that it should be used for pharmaceutical rather than purely scientific research, and he was glad to know that recently it had been doing better in that respect. In the past the Research Laboratory had contributed considerably towards the advancement of scientific men, but very little towards pharmaceutical advancement. He strongly pressed for the basement of the laboratory to be fitted up with pharmaceutical apparatus, and for some time it was known as "Symes' playground." He was glad that Mr. Tyrer had referred to the matter, and he hoped that something would be

done, because there was no place in this country where pharmacists could go for disinterested advice in connection with the fitting up of a pharmaceutical laboratory.

Mr. H. WIPPELL GADD (Exeter) asked how the funds were provided to maintain the pharmaceutical institute at Berlin—whether they were public funds or a sufficient number of students to make it self-supporting.

Mr. MACEWAN explained that it was a department of the University of Berlin, and the Germans were more apt to look to the Government for help in educational work than was the case in England. The Pharmaceutical Institute was not built for to-day, but for the next generation, and that was why the Germans were ahead of England in educational matters—they looked forward. In regard to students, there were between thirty and forty attending the institute, and their fees would come to about £10 each.

Mr. DRUCE (Oxford) said that when visiting the educational institutions of Buda-Pesth recently he was very much ashamed of the backward condition of teaching in this country, as compared with that at Buda-Pesth. He saw there pharmaceutical students studying side by side with medical students, and it was very pleasing to see such a thorough system of teaching. He hoped that in the near future a more thorough and more comprehensive method of teaching would be adopted here.

Mr. CHARLES KERR (Dundee) said that the remarks of Mr. Druce reminded him of what he saw at Beyrout in Syria, in connection with the American Mission College. They had there a thoroughly-equipped laboratory for pharmacists. He was taken over the dispensing rooms, and was very much struck by the beauty of the apparatus and the manner in which the rooms were laid out for instructing students of pharmacy. There was a two years' curriculum, and the fees were £10 a year for those who lived out, and about £30 for those who lived on the premises. The institute was supported by voluntary contributions from America, and he thought it was an excellent example of voluntary work as compared with government institutions.

The PRESIDENT said he knew the Institute mentioned by Mr. Kerr, but it must be remembered that Americans did not educate

their pharmacists as they were educated in England. Moreover, it was a missionary effort.

A vote of thanks to Mr. MacEwan was carried by acclamation.

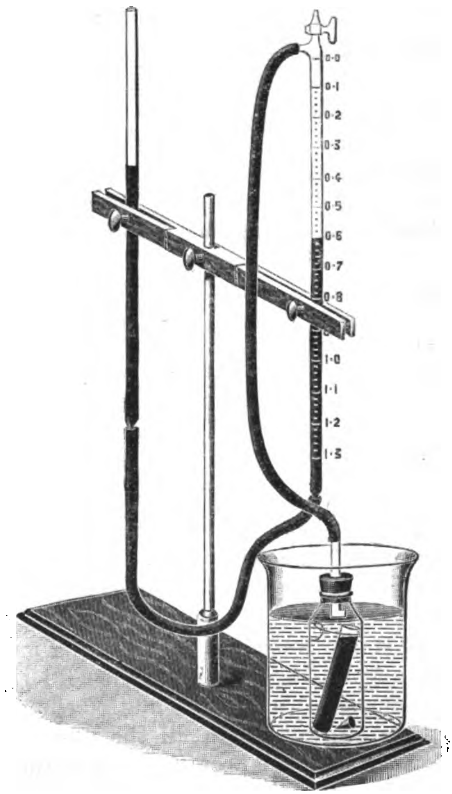
A NEW METHOD FOR THE DETERMINATION OF URIC ACID IN URINE.

By A. F. Dimmock, M.D., M.R.C.S., L.S.A.,
Medical Officer of the Harrogate Infirmary,
and
F. W. Branson, F.I.C., F.C.S.

The authors have devised the following method, which has been found to work easily: 100 c.c. of the urine are taken and warmed to about 40° C., and then saturated with 31 Gm. of ammonium chloride, the whole being well shaken in a stoppered measuring glass, graduated at 100 c.c., until complete solution of the ammonium chloride is effected. The contents will now be at a temperature of about 15°C., and should be left for at least two hours (preferably twelve) for the precipitate of urate of ammonium to subside. Should any of the precipitate have a tendency to remain near the surface a gentle rotation of the measuring glass will cause it to settle. The supernatant liquid is poured off, and the portion left is carefully filtered through a small filter-paper (diameter about 5·5 cm.), as by Hopkin's method. The precipitate is carefully washed with a very dilute solution of ammonia, consisting of one part liq. ammon. fort. in 1,000 of distilled water.

The precipitate is best washed in the following manner: Allow the liquid to drain from the precipitate, then fill the filter-paper with the dilute ammonia solution contained in a wash bottle. Allow this to drain off, and again fill the filter-paper with the ammonia solution. Repeat this operation a third time. Test some of the filtrate with a 5 per cent. solution of nitrate of silver, acidulated with nitric acid 5 per cent. Only a very slight precipitate should be given indicating the absence of any appreciable amount of ammonium chloride, but should the filtrate still contain this salt wash with a small additional amount of dilute ammonia. Place the precipitate with the filter-paper in the generating bottle, fill the tube up to the mark (25 c.c.) with the

hypobromite solution, and lower it into the bottle (as shown in illustration) by means of a piece of string. Note the temperature of the hypobromite solution, which should approximate to that of the room in which the estimation is to be made. Now place the cork in the generating bottle, and plunge the bottle in a vessel of cold water of a similar temperature to that of the hypobromite solution. After two minutes adjust the water level in the measuring



burette to zero, and then close the tap, and note that the water level remains constant. In order to test if leakage occurs in any part of the apparatus, alter the water level in the measuring burette; any defect is then easily seen. Finally tilt the generating bottle, and allow the reagent to flow out of the tube, and shake

so as to promote the reaction between the sodium hypobromite and the ammonium urate. After ten minutes, during which time the bottle should be shaken at intervals, the level in the two tubes is adjusted, and the percentage of uric acid read off, as indicated by the nitrogen evolved.

The process appears to be quite suitable for proportions of uric acid ranging from 1 in 1,000 to 1 in 10,000. The factors for the graduation of the burette (parts per 1,000) have been obtained by means of numerous determinations of solutions prepared from pure uric acid, urea (2 per cent.), and normal phosphates, chlorides, and inorganic constituents. Six determinations of 100 c.c. of a solution containing 0·6 part of uric acid per 1,000 gave a mean of 8·5 c.c. of nitrogen.

By the addition of a second scale (graduated in parts per 100) to the burette, the instrument may be used as a ureameter, 2 c.c. of urine being taken for each estimation. This quantity is transferred by means of a pipette to the generating bottle, in which is placed a tube containing 25 c.c. sodium hypobromite solution. The subsequent procedure is the same as for the estimation of uric acid. The solution of hypobromite of soda is made by dissolving 100 Gm. of caustic soda in 250 c.c. of water, then adding 22 c.c. of bromine.

Mr. W. A. H. NAYLOR (London) asked what was intended by liq. ammon. fort.; whether the specific gravity was 0·880 or that of the B.P.?

Mr. F. H. ALCOCK (Birmingham) asked what amount of wash water was found to be the most suitable to effectually wash the precipitate without undue loss. He also desired to know what was the real composition of the precipitate, and whether it was contaminated by other organic substances found in urine.

Mr. BRANSON replied that solution of ammonia of sp. gr. 0·880 was rarely found in commerce of full strength, and that the B.P. strength of sp. gr. 0·891 was used; further, that dilution of 1 in 10,000 of uric acid gave quite practicable amounts of nitrogen for the purpose of measurement. Respecting Mr. Alcock's questions, he said that the statements of A. H. Allen and F. G. Hopkins were accepted as to the composition of the acid ammonium urate, $C_5H_3(NH_4)N_4O_3$, which did not under normal conditions contain either creatinine or any other interfering substance in appreciable amount.

In order that the graduations on the burette should correspond to the quantities of uric acid indicated, it was necessary to use a definite volume of dilute ammonia, as a little loss always occurred in washing. For normal proportions of urates 10 c.c. was sufficient, but for higher percentages as much as 15 c.c. would be required.

COMPARATIVE ANATOMY OF THE BARKS OF THE SALICACEÆ.—PART I.

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Introductory.

In a paper presented to this Conference last year by Dr. H. A. D. Jowett and Mr. C. E. Potter, entitled "Variations in the Occurrence of Salicin and Salinigrin in Different Willow and Poplar Barks" (*Year-Book*, **1902**, 483), they showed that differences of species were not the only factors to be considered in ascertaining the probable yield of glucoside by these barks. The factor of species, however, is one of considerable importance, as instanced, for example, by the fact that *Salix discolor* yields salinigrin instead of salicin, while manufacturers of the latter state that *S. viminalis* never yields any glucoside. It is well known that the accurate determination of species in the Salicaceæ, more especially in the willows, is at times a matter of great difficulty, even with complete herbarium specimens. The addition, if possible, of diagnostic characters gleaned from a study of the anatomy of their barks cannot fail, therefore, to be of some value. When we add to this the fact that the manufacturer or the pharmacist seldom has anything but the bark itself to guide him in its identification, the importance of such characters becomes manifest.

In view of the complexity and length of the study here undertaken, it has been found necessary to place some limitations on its treatment from the comparative standpoint. It will, therefore, be well to state at the outset that, in seeking for characters which may serve to differentiate the barks, that stage (with one exception) has been chosen in which the epidermis has been thrown off, but before internal periderms have begun to form. Furthermore, only transverse sections have been considered,

although a large number of radial and tangential sections has been examined, in order to check the accuracy of the interpretation of transverse sections. In considering the general features of the group, I have also thought it desirable to record some observations on the younger stages, but in the detailed examination the limits set forth above have been adhered to.

General.

The observations hitherto recorded consist, for the most part, of structural descriptions of the barks of a few species (of *Salix* mostly) and of the histological details of portions (especially the epidermis and cork of the willows) of a larger number of them. For the comparative study of a more extensive series of barks we are indebted to von Höhnel, who examined eleven species of *Salix*, and to Moeller, who described four species of *Populus* and two of *Salix* in some detail, and upon them based an account of the anatomical features of the whole group. As frequent reference will be made to the statements of these various investigators, a list of such of their works as have been consulted is here appended:—

Dr. Franz R. Höhnel, *Die Gerberinden*, pp. 87–95. Berlin, 1880. Hereinafter referred to as "von Höhnel."

Dr. Joseph Moeller, *Anatomie der Baumrinden*, pp. 89–95. Berlin, 1882. This contains citations of the earlier literature. Hereinafter referred to as "Moeller."

Dr. A. de Bary, *Comparative Anatomy of the Phanerogams and Ferns*. Bower and Scott's translation. Oxford, 1884. Also contains citations of the earlier literature. Hereinafter referred to as "de Bary."

H. Douliot, "Recherches sur le Periderme," in *Annales des Sciences naturelles*, septième série, tome dixième, p. 330. Paris, 1889. Hereinafter referred to as "Douliot."

Dr. J. E. Weiss, "Beiträge zur Kenntnis der Korkbildung," in *Bayerischen Botanischen Gesellschaft zu Regensburg*, p. 52. Regensburg, 1890. Hereinafter referred to as "Weiss."

Hermann Ross, "Contribuzioni alla Conoscenza del Periderma," in *Malpighia*, vol. iv. p. 104. Genova, 1890–1. Hereinafter referred to as "Ross."

MM. G. Planchon et E. Collin, *Les Drogues Simples d'Origine Végétale*, tome premier, pp. 254–6. Paris, 1895. Hereinafter referred to as "Planchon and Collin."

Dr. Hans Solereder, *Systematische Anatomie der Dicotyledonen*, pp. 896–8. Stuttgart, 1899. Hereinafter referred to as 'Solereder."

In the general description of the anatomical features of the barks of the Salicaceæ, the tissues will first be considered in order, beginning at the periphery, and such of these features as are considered to be of importance in differentiating the two genera of which the order consists will then be enumerated.

1. The Epidermis and the Tissues Derived from the Phellogen.

The epidermis, which will be only briefly referred to here, consists of small cells which are nearly cubical or slightly elongated tangentially in transverse section, and which possess thickened and cuticularized outer walls. Tangential elongation is, on the whole, more frequent in the poplars (*cp.*, Figs. 1, 2, 3, and 6) than in the willows (*cp.*, Figs. 10, 11, 13 and 14), whereas the thickening of the outer wall is, as a rule, more pronounced in the willows than in the poplars; the former, however, differ among themselves to some extent in this respect—compare, for instance, Fig. 10 (*S. alba*) with Figs. 11 (*S. wardi*), and 13 or 14 (*S. viminalis*). The epidermis may be glabrous, or nearly so (*P. angustifolia*, *S. pentandra*), or it may be provided with hairs (*P. alba*, *S. caprea*). It is interesting to note, in this connection, that the bud-scales of *P. fremonti* possess hairs which are stained pink with phloroglucin and hydrochloric acid when cut or broken, but are unaffected by that reagent when intact.

The origin of the periderm has been repeatedly investigated by various workers in a number of species of *Populus* and *Salix*, and the main conclusions are satisfactorily established, but in matters of detail there are some discrepancies which will now be considered.

In *Salix* the periderm originates in the epidermis itself (Figs. 10, 13, and 14). No exceptions to this rule appear to have been recorded, and I have not observed any. With regard to the products of the activity of the phellogen, the same unanimity does not exist. According to de Bary (p. 549), each initial epidermal cell, in most investigated species of *Salix*, produces in the first year *one* cork cell externally, and *one* phellodermal cell internally; between the two there is a central meristematic cell, with its wall thickened on the outside, and immediately becoming cuticularized

on the external thickened surface. In this central meristematic cell the same division and differentiation as in the initial epidermal cell is repeated in the second year, and the same process takes place in each succeeding year, starting from the meristematic cell for the time being, until the formation of outer bark begins at a later period. Von Höhnel (p. 91) confirms the above as far as the configuration of the cork cells is concerned. Weiss also confirms this point, but in the six species of *Salix* (these include *S. caprea* and *S. alba*) which he investigated he found that, almost without exception, a phelloderm cell was formed by the first tangential wall, and that, by the second and several succeeding ones, cork cells were cut off on the outer side. The observations of Ross coincide, on the whole, with those of de Bary, but he contends that it is the inner wall of the outermost cell resulting from the division of the initial epidermal cell (i.e. the one which bears the cuticle externally) which becomes thickened, and not the outer wall of the central meristematic cell; and he emphasizes his contention by stating that this is the only case known in which the suberized lamella is more strongly developed on the inner wall than on the other walls of a cell. He also introduces another slight variation in asserting that there may be two layers of periderm or cork ("phellem") formed annually. Moeller (p. 89) makes no reference to the presence of phelloderm, but confirms the formation of a single row of cork cells annually; he, however, specifically modifies the statement that the outer walls of each layer of cells become thickened, and holds that this may only occur at intervals, as instanced by *S. fragilis*. Finally, Douliot asserts that no phelloderm is formed (in *S. caprea*)—during the first two years, at all events—and that the quantity of cork produced is dependent on the amount of illumination which the plant receives, being abundant in the light, but scanty in the shade. It would appear, further, that, of the rows of cork formed during the course of one year, only the last formed becomes thickened in the external portion of its cells.

My own observations, which are still incomplete, but which I hope to supplement in Part II., dealing more particularly with the willows, would lead me to conclude that, in the large majority of cases, the observations recorded by de Bary (waiving, for the present, the rather fine issue raised by Ross as to the localization of the region of thickening) hold good, with the exception, perhaps, of the amount of phelloderm formed annually. It is only fair to state, however, that the observations which I have so

far been able to make on the amount of phelloderm formed annually are hardly sufficient to justify an expression of opinion one way or the other, inasmuch as these phelloderm cells are subject to tangential elongation soon after they are formed, and ultimately become excessively drawn out, so that any indication of their mode of origin is entirely obliterated. The exceptions to the rule that a phelloderm cell is formed by the first tangential wall do not seem to be so rare as Weiss has supposed (see Figs. 13 and 14), but this will be discussed later. The presence of intervening rows of thin-walled cork cells between those which have thickened outer walls appears, on the other hand, to be an exceptional feature; the examples of it which I have had under my own observation occur locally, a fact which would seem to lend support to Douliot's conclusions. But in the one case of *S. wardi* the exception becomes the rule (Fig. 11), and in the second year the formation of internal periderms begins (Fig. 9), these frequently going so far as to enclose groups of the pericyclic fibres. The outer bark in this instance (*k.*, Fig. 9) includes many layers of thin-walled cells which are manifestly due to the activity of a phellogen.

From what has been said above it will be seen that the thickened cells of the periderm form a characteristic feature of the willow barks. Their thickened outer walls bulge outwards, presenting a convex surface externally and a concave one internally—especially well seen in a radial section: they are always suberized, but not lignified. The following differences in the characters exhibited by the cells of the periderm of different species appear to be of diagnostic value:—

1. Size of the cells, especially as measured in a tangential direction. Thus, the cells of the periderm in the bark of *S. fluviatilis* are much more delicate than those of *S. purpurea* (Fig. 12), and seldom attain more than half the size of the latter in a tangential direction.

2. Amount of thickening which the outer walls undergo. Thus, in *S. viminalis* (Fig. 15) and *S. triandra* these walls are relatively thin, while in *S. purpurea* (Fig. 12) and in the majority of willows they are much thicker.

3. The shape of the thickenings. Thus, in *S. missouriensis* and *S. viridis* (compare, also, Fig. 12) the outer surface is usually verrucose or mammillated, while in *S. nigra* and *S. viminalis* (Fig. 15) it is nearly even. It must be remembered, however, that the walls in the outer rows may become more or less

straightened out by tangential extension. The factor considered below is undoubtedly of some importance also in this connection.

4. The number of cork cells adhering to the bark. This factor, as one would expect, is subject to considerable variation, but the striking contrast of a case like *S. viridis*, which sometimes exhibits as many as seven rows of adherent cork cells, with *S. nigra*, which rarely possesses more than two rows, cannot fail to be of some value. The causes which appear to underlie this factor of adherence or non-adherence of the periderm layers are of great interest, but a discussion of them at this stage would take us beyond the limits of this part of the subject; they will accordingly be treated of in Part II.

The colour of the cork membranes is, according to de Bary (p. 112), distinctive also, these being colourless in some species (*S. viminalis*, *S. aurita*, and *S. caprea*) and yellow in others (*S. alba*, *S. purpurea*, and *S. fragilis*). I must confess that I have not been able to corroborate this satisfactorily, owing probably to the fact that these calls frequently contain varnish-like golden-brown colouring matter, which gives a fictitious tint to their walls. It is possible, however, that these differences may become apparent after treatment with a suitable clearing reagent.

In *Populus* the periderm originates in the layer of cells immediately below the epidermis (*k.*, Fig. 2). It is only in *P. fremonti* that I have noticed any departure from this rule (see Fig. 6, where the periderm has evidently originated in the third hypodermal layer), and even there it is of the nature of an irregularity, inasmuch as the normal condition is uniformly exhibited by the large majority of sections. Phelloderm is only formed after one or more rows of cork cells have been cut off. In Fig. 3 the first four rows of cells below the epidermis are cork cells; the narrow fifth row is, ostensibly, the meristematic layer or phellogen, in that it contains protoplasmic contents, and is limited by extremely thin tangential walls, while two cells on the left of the figure have just been cut off from it externally; the sixth row is the phelloderm. In *P. fremonti* the layer which corresponds in position to the phellogen in other poplars always appears to convert itself into a layer of stone cells at the end of the season (*sc. l.*, Fig. 6). The succeeding season's periderm, which originates from the phelloderm, if such it be, is terminated in the same way by a similar layer of stone cells, so that the peri-

derm of an older piece of bark exhibits a more or less concentric series of sclerenchymatous layers (*sc. l.*, Fig. 7). The outer layers of the periderm, however, show a strong tendency to exfoliate, and the last-formed layer of stone cells is sometimes exposed.

The cork cells of young poplar twigs are nearly isodiametric, or somewhat elongated radially (*k.*, Figs. 2, 3, and 6), in older barks they usually present the customary flattened and tangentially elongated outline (*k.*, Figs. 5 and 8); the extent to which tangential elongation occurs may vary somewhat, however, even in the same section, and is generally least pronounced where the production of cork is vigorous. These periderms consist, with few exceptions, of thin-walled suberized cells: in *P. deltoides* and *P. pyramidalis* I have occasionally observed tangential bands of thickened cells (*sc.*, Fig. 8) and more examples of this could, doubtless, be found, especially in cases where the periderm is copiously developed; but it is only in *P. fremonti* that the regular formation of bands of thickened cells becomes (apparently) a fixed and constant feature.[1] In all these cases the thickened portions of such cells are, without exception, lignified, while the region of thickening extends uniformly around the whole cell; the latter point is, nevertheless, subject to many fluctuations. The amount of phelloderm formed in *Populus* is always slight. With the one exception of *P. fremonti*, the periderms of the poplars do not afford any characters of much diagnostic value, although the relative thicknesses of the periderms as a whole, in different species, may be of some importance in extreme cases: thus the covering of periderm in *P. tremuloides* and *P. grandidentata* (Figs. 28 and 30) is almost invariably thin, while in *P. angustifolia* and *P. pyramidalis* (Figs. 34 and 36) it is thick, sometimes excessively so.

2. Cortex.

The cortex in both genera exhibits a collenchymatous outer portion. This may vary, within certain limits, in the same species,

[1] It is, of course, possible that this peculiarity may be dependent upon ecological factors, and as I have only examined specimens from one locality (San Bernardino, S. California), the particulars of the latter, which were very kindly furnished by Mr. S. B. Parish, of S. Bernardino, Cal., are herewith appended:—"Specimens from a tree about 2½ ft. in diameter, about 40 ft. high, and not over thirty years old. Growing in loamy soil which is naturally somewhat damp, and contains a noticeable percentage of alkali, as indicated by the growth of *Distichlis maritima* and *Baccharis emeryi.*"

it being frequently the case, for instance, that both the number of layers and the amount of thickening which they have undergone are relatively greater in the younger stages than in the older ones; any differences in this direction, therefore, must be interpreted with caution in comparing the barks of different species. With these reservations, then, it may be stated broadly that collenchyma, though not copiously produced, is more consistently and regularly present in the willows than in the poplars; among the latter its characters are not constant enough to be made use of, although some species show a stronger tendency towards collenchyma than others: thus the larger portion of the narrow cortex of *P. alba* is usually strongly collenchymatous, whereas in *P. fremonti* there appears to be little collenchyma at any stage. The internal portion of the cortex consists of thin-walled cortical parenchyma of the usual type. Stone cells or groups of stone cells (*sc.*, Figs. 3, 5, and 24) are always to be found in the cortex of poplars—Moeller (p. 90) cites *P. nigra* as an exception, but this is incorrect—whereas stone cells have only been recorded from three species of *Salix*, viz. *S. alba*, *S. fragilis* (von Höhnel, p. 93), and *S. caprea* (Moeller, p. 90); von Höhnel specifically states that they are absent from *S. caprea* (p. 93). I have so far been unable to find them in the specimens of *S. alba* and *S. caprea* which I have examined, but it is very probable that they are present in the former species, seeing that they are common in the var. *vitellina*, where they appear to originate in the pericycle as well. In *S. fragilis* they are few and far between, and in the majority of sections they are not shown; it may be owing to this factor that an apparent contradiction occurs in some of Moeller's statements—he states on p. 95 that small groups of stone cells sometimes occur in the primary bark of *S. fragilis*, whereas on p. 90 he just as unequivocally maintains that *S. fragilis* forms no stone cells.[1] In all the other willow barks which I have examined, viz. those of *S. aurita* × *caprea*, *S. babylonica*, L., *S. cordata*, Muhl., *S. discolor*, Muhl., *S. fluviatilis*, Nuttall, *S. fragilis*, L., *S. hippophaifolia*, Thuill., *S. missouriensis*, Bebb, *S. nigra*, Marsh., *S. nigricans*, Sm., *S. pentandra*, L., *S. phylicifolia*, L., *S. purpurea*, L., *S. purpurea* var. *minor*, *S. rubra*, Huds., *S. triandra*, L., *S. viminalis*, L., *S. viridis*, Fries., and *S. wardi*, Bebb, I have so far failed to detect any stone cells in the cortex (or in any other part

[1] It is also possible that a transposition of names may have occurred on one of the pages, for it is further stated on p. 94 that sclerotized parenchymatous cells are entirely wanting in the bark of *S. caprea*.

of the bark). In *Populus* the quantity and grouping of the stone cells can be profitably utilized in differentiating the barks—their shape and size seem to possess but little diagnostic value—while the dimensions of the whole cortex are also of some importance, as will be shown presently. Wherever stone cells occur (whether in *Populus* or in *Salix*) they are always encrusted with prismatic crystals of calcium oxalate (*cryst.*, Figs. 3, 5, and 24). Sacs containing cluster crystals of calcium oxalate invariably occur in the cortex of both genera, but they are much more abundant in some species than in others; thus, in *S. viminalis* and *P. alba* (Fig. 29) they occur but sparingly, while in *S. alba* and *P. nigra* (Fig. 37) they are abundant. I have found starch present in very small grains, in the cortex of some willows and poplars and absent in others, but, in view of the fact that the barks were collected at widely varying periods of the year, this point has not been pursued any further. *S. fragilis* and *P. canescens* are examples of barks in which abundant starch grains were seen, and *S. purpurea* and *P. angustifolia*, in which they were absent. It is evident, however, that the statement made by Moeller in his atlas [1] that willow bark never contains starch, requires modification.

3. The Region of the Pericycle.

Dealing first with the pericyclic fibre-groups, we have Moeller's assertion (p. 91) that their fibres are remarkably small in comparison with those of the secondary bast. This observation appears to hold good in the case of the poplars, with few exceptions; actual measurement tends to show, however, that the difference is not, in many cases, as great as one might be led to believe. Figs. 16 and 17 (*b.f.*) exhibit the greatest extremes that I have seen (*P. tremuloides*). But in the 23 willows examined and enumerated above I have failed to confirm Moeller's statement in a single case: in the large majority of instances there is no appreciable difference in their size, but the fibres of the pericycle are slightly larger, if anything; in the few cases where there is a noticeable, although slight, difference—as in *S. missouriensis* and *S. nigricans*, for example—the advantage is on the side of the pericyclic fibres. As it is important to be able to distinguish the pericyclic fibres from those of the secondary bast, it will be necessary to consider both of them here, although the consideration of the bast fibres belongs more properly to the next section. Both are usually polygonal in

[1] *Pharmacognostischer Atlas*, von Dr. J. Moeller, p. 282. Berlin, 1892.

transverse section, but the pericyclic fibres frequently possess a tendency to become rounded at the corners and elongated in a tangential direction. In *Populus* the fibres of the bast never exhibit sharp striæ, whereas those of the pericycle generally do—compare Fig. 16 with Figs. 17, 19, 20, etc., on this point: the finer concentric lines which I have drawn in Fig. 18 are somewhat hypothetical, and were introduced mainly as shading; finding that they might tend to mislead, I have omitted them from all subsequent sketches. In *Salix*, in the large majority of cases, both sets of fibres exhibit very distinct striations; so very sharp, indeed, are these in many instances that they present the appearance of deep grooves formed by an etching needle. The striations are frequently finer and more numerous in the pericyclic than in the bast fibres, but exceptions occur which will be considered in detail later on. In both genera the fibres of the pericycle, with few exceptions, react much less strongly with phloroglucin and hydrochloric acid than those of the bast—a feature which usually affords a ready means of identification. The "middle lamella" is everywhere the most lignified part of the fibres, and is uniformly relatively thin in the bast fibres of the poplars, but subject to variations elsewhere. The groups of fibres in the bast are beset with sacs containing prismatic crystals of calcium oxalate, whereas these sacs usually occur but sparingly in connection with the groups of the pericycle. This factor is, no doubt, responsible to some extent for the darker appearance which a fibrous group of the bast presents after treatment with phloroglucin and hydrochloric acid, inasmuch as the crystals in the sacs are enclosed in an envelope—said by Pfitzer (de Bary, p. 140) and by Moeller (p. 92) to consist of cellulose (!)—which is very deeply stained by that reagent. By means of a combination of the above factors it is nearly always possible to distinguish the pericyclic fibres from those of the bast, for although one or more of these factors may not hold good in individual cases, the residue of them is usually ample to settle the question.

The groups of pericyclic fibres may or may not become broken up as the bark increases in thickness, but in the poplars, at all events, their behaviour is too erratic to be of much diagnostic value (compare Figs. 37 and 38, both representing *P. nigra*). Where extensive tangential bands of stone cells arise in the pericycle, the splitting apart of the fibrous groups is nevertheless usually more pronounced than in those cases where such bands are feebly developed or not at all (compare, for example, Figs. 28 and 31 with

Figs. 32 and 38). Large groups of pericyclic fibres are also more commonly to be found where the bast rays are wide and sharply delimited, as in *S. cordata* and *P. nigra.* As has already been hinted at above, stone cells occur in the pericycle; the extent to which they are developed and the nature of their distribution are factors of great importance in classifying the poplar barks. The fact that stone cells occur in the pericyclic region of *S. alba* var. *vitellina* has already been mentioned above; I have never seen stone cells internally to this in either of the two willows in which they were found by me.

In those parts where neither pericyclic fibres nor bands of stone cells occur it is not usually possible to distinguish the pericyclic region from the cortex on the one hand, or from the outer part of the medullary rays on the other; but barks in which the parenchymatous cells generally are filled with dense contents, commonly exhibit a connecting tangential band of cells, with more scanty contents than the others, between the pericyclic fibre groups. It is convenient in such a case to look upon these clearer bands as part of the pericycle.

4. The Bast.

The separation of the bast into wedge-shaped bast rays and intervening widened medullary rays is very well shown in some barks (*S. cordata*, *S. nigra*, *P. tremula*, and *P. fremonti*, for example), but in others the very reverse is the case (*S. purpurea*, *S. alba*, *P. canescens*, *P. pyramidalis*). It is interesting to note that de Bary (p. 536) took the willows—or, more exactly, "*S. fragilis* and allies"—as a type of the latter case, and ascribed the condition of affairs to uniform dilatation of the parenchyma. He states that if attention be directed to cases of extreme difference it is found that in the one case [1] (the one just mentioned) dilatation of the entire parenchyma of the bast takes place in an approximately uniform proportion, as each annular zone becomes shifted outwards. In all the radial bands, and thus most clearly in the medullary rays of every degree, the parenchymatous cells increase uniformly, and quite gradually in breadth, in the centrifugal direction. The intermediate non-equivalent tissues, which do not grow with them, especially sieve tubes and bast fibres, thus become uniformly removed one from another, and the more so the further they are from the cambium. In the other extreme case the dilatation is unequal in the various bands of the transverse

[1] See also the figure in Planchon and Collin, p. 255.

section; it amounts to little or nothing in the bundles, and is most active, either in all the parenchymatous (= "medullary") rays or in some of them. Between the lateral limits of these dilated rays the arrangement and lateral distance from one another of all elements of the tissues remains approximately the same. Details are then given of *Tilia*, which is a typical case of this category, and which exhibits the resulting severance of the bast into wedge-shaped bast rays and medullary rays very distinctly; *Salix cordata*, however, would have illustrated the point almost as well, although the inner portions of the medullary rays are, unlike those of *Tilia*, only one cell thick, and no more. In addition to the above factors, displacement of the tissues, by stone cells in the case of some species of *Populus*, and by the distension of scattered parenchymatous cells in the case of *S. babylonica*, appears to play a part of some importance in preventing the formation of clearly defined wedge-shaped bast rays. Stone cells are invariably present in the bast of *Populus*; this has been denied by Moeller for *P. nigra* (pp. 90 and 93), but all the sections of the latter which I have examined contain them. Stone cells are always absent from the bast of *Salix*. The size and shape of the stone cells usually show differences as great among themselves in any one bark as they do from one bark to the other, so that they possess little diagnostic importance. *P. tremula*, however, exhibits some mature stone cells, which possess thinner walls than in the other species; but even here the majority of them are furnished with very thick walls (*sc.*, Figs. 18 and 23), as in the other species (*sc.*, Figs. 17, 19, 20, 23, 25); their walls are always distinctly striated. In the larger cells these walls are frequently traversed by numerous branching pits (similar to those shown in the group of cortical sclerenchyma on the right of Fig. 24), while they are less abundant in the smaller ones; the converse, however, or anything between the two, is by no means rare (compare figures on Plates III. and IV.).

The amount and mode of grouping of these elements are, in contradistinction to their individual features, of the very greatest importance for comparative purposes, and will be fully dealt with below.

The medullary rays in both genera always consist of a single row of cells in the internal portion of the bark. In certain species of *Salix* (*S. alba*, *S. pentandra*) some of their cells are swollen out like bladders; this never seems to occur in the poplars. The cells of the medullary rays in this region usually show the customary

radial elongation, and can thereby be readily identified (*S. nigra*, *P. alba*), but in some cases this is so little accentuated that their identification is rendered more difficult (*S. nigricans*, *P. pyramidalis*). Toward the exterior the medullary rays expand in very varying degrees, and become many cells wide in the form with wedge-shaped bast rays. It is in these widened portions that stone cells are most constantly to be found in the poplars; it is to be noted in this connection that Moeller (p. 90) commits himself to the statement that the medullary rays do not become sclerotic in their passage through the clefts of the fibre plates.[1] It is reasonable to assume that the spaces between the fibre groups in the widened portions of the medullary rays are excluded in the definition, for Moeller's observation would otherwise be palpably inaccurate. Taking it for granted, therefore, that only the unexpanded portions of the medullary rays are referred to, it must be admitted that, even then, this contention is not justified by the facts, as Figs. 18 (*P. tremula*), 19, and 20 (*P. angustifolia*) clearly show. In the majority of instances, however, the medullary rays do not become sclërotized when in the single-rowed condition. It must be specially emphasized that nothing of all this applies to the willows, inasmuch as the latter never become sclerotized in any part whatsoever of the bast. Moeller's further statement that the medullary rays never take part in covering the bundles of fibres with crystals is also not quite correct, for I have occasionally observed prismatic crystals in this position in a number of species of *Populus* and *Salix* (see *cryst.*, Figs. 18, 19, 20, and 22).

With regard to the occurrence of calcium oxalate in other parts of the medullary rays, Moeller states that the medullary rays, generally, very seldom contain calcium óxalate. This holds good in the main, as far as the single-rowed parts of the rays are concerned, but clusters are sometimes to be found in them (*S. caprea*, *P. tremula*); but, as soon as the medullary rays begin to divide, cluster crystals are, as a rule, more abundant in them than in any other portion of the bark (*S. caprea*, *S. cordata*, *P. tremula*, *P. fremonti*; compare also Figs. 28 to 39). As Moeller only recognizes widenings of the medullary rays in one case, viz., that of *P. tremula*, it is not strange that he should omit to record the existence of calcium oxalate in them. Some of these expansions in *P. tremula* are, as Moeller states, of fusiform outline in transverse section; very good examples of these are also to be found in *P. alba*

[1] "Auch werden sie bei ihrem Durchtritt zwischen den Spalten der Faserplatten nicht sklerotisch."

(Fig. 29), and occasionally in *P. grandidentata*. Such expansions are evidently only irregularities in the formation of the orthodox wedge-shaped bast rays, as may be seen by an inspection of a series of sections. Prismatic crystals are rare in the medullary rays (or any other part of the bark) unless accompanied by sclerenchyma of some kind. If an apparently isolated sac containing prismatic crystals be found, it is almost sure to prove, on further investigation, to consist of the borders of a mass of stone cells, or to be the prelude to the formation of sclerenchyma. *P. tremula*, which contains enormous sclerotic masses here and there (Fig. 32), illustrates the first point very well, as may be seen from Fig. 23, representing part of a medullary ray. In the upper portion of the crystal-containing area, shown in the figure, the stone cells, although omitted from the sketch, are easily seen in the actual section by focussing down, while one of the stone cells is shown at the bottom of the figure, projecting beyond the others. In the bast of the willows prismatic crystals are accordingly very rare, except in connection with the fibre groups; such crystals, however, are present according to von Höhnel (p. 92), in the bast of *S. amygdalina*, but I have not so far examined the bark of this species.

The bast fibres occur in groups of varying thicknesses, according to the species, and are usually arranged in tangential bands, interrupted by the medullary rays, and alternating with tangential bands of soft bast, which are likewise interrupted by the medullary rays. The tangential banding of the bast fibre groups in the willows rarely exhibits any serious irregularity, except suppression of groups. According to de Bary (p. 527), a regular alternation of concentric zones of fibres and soft bast, of definite average breadth, takes place, within certain limits, in species of *Salix*. This appears to be correct in the majority of species, but in *S. aurita* × *Caprea*, *S. caprea*, *S. babylonica*, *S. fragilis*, *S. discolor*, *S. cordata*, *S. nigricans*, and, to a less extent, in *S. rubra*, I have observed bands of soft bast, which occur at apparently regular intervals, and are usually more than twice as thick as the others: in these wider bands sieve tissue is very copiously developed. In *Populus* I have not observed any peculiarities of this kind, but any deficiencies in this direction are more than amply compensated by decided eccentricities in other directions, and the irregularities which the configuration and distribution of the bast-fibre groups exhibit in such species of *P. tremula* and *P. fremonti* far exceed anything

occurring in the willows. In both genera the thickness of the fibre-groups and the extent to which they are suppressed are characters of good differential value (compare, for instance, *Salix viridis* and *P. nigra*, which have thin and frequently distant fibre groups, with *S. viminalis* and *P. tremuloides*, where the fibre groups are thick and rarely suppressed).

The soft bast is composed of bast parenchyma and sieve tissue. The sieve tubes can be generally distinguished from the bast parenchyma by their larger size, their more scanty contents, their sharper angles, their tendency to collapse, and by the presence of sieve plates (*s.p.*, Fig. 26), which are compound and situated on very oblique walls (as may be readily verified in longitudinal section), so that their cross section—sometimes slightly oblique—is always seen in a transverse section of the bark, usually between two of the tangentially juxtaposed tubes. In a few cases, however, the difference in size between them and the parenchymatous cells is negligible (*P. fremonti*, *S. alba*), while in *S. babylonica* the very much distended parenchymatous cells, which are distributed throughout the parenchymatous portions of the bark, exceed the sieve-tubes in size. There are other individual variations, especially in the poplars, but these will be considered later.

Crystal sacs occur in the soft bast of all the Salicaceæ, but the amount present is very different according to the species; thus in *S. fragilis* and *P. pyramidalis* they are extremely abundant, but scarce in *P. alba*, and almost absent in *S. triandra*. These sacs contain cluster crystals, the presence of prismatic crystals being governed by the factors previously mentioned.[1]

Summarizing now the points which are likely to be of use in distinguishing the poplar barks from those of the willows, we find that: (1) The periderm of the willows is sharply differentiated from that of the poplars by the presence in the former, and by the absence in the latter, of cells which are thickened on the outer walls only, these thickened portions being suberized, but not lignified. (2) Stone cells are invariably present in the bast of the poplars, but always absent from that of the willows. The pericyclic fibres in the poplars are, with a few exceptions, smaller than those of the bast. In the willows this is never the case. The

[1] The observation made by de Bary (p. 530), but stated by him to require re-investigation, that both the cluster crystals and the prismatic crystals in *Salix* occur in the bundles exclusively, or to much the greater extent, is certainly not accurate in a large number of cases, as far as the cluster crystals are concerned, but this will be considered in greater detail later.

bast fibres in *Populus* are also generally distinguished from those of *Salix* by their larger size and absence of evident striation, but neither of these characters affords such valuable evidence of identity as those mentioned above.

Systematic Examination of the Poplar Barks.

In this section the salient features of the barks examined, arranged in what is considered to be a fairly natural series, will first be described *seriatim*, and will be preceded, in each case, by a statement of the locality and date of collection (as far as known), and of the authority responsible for the determination. The whole will then be concluded by the construction of a key for the entire series.

Before proceeding to the descriptions, special attention is directed to the following conventional signs at the head of Plate I., as these are absolutely essential for a correct understanding of the figures:—

Cork or periderm is represented by crossed tangential and radial lines, the cortex and outer parts of medullary rays (and incidentally, the parenchymatous portions of the pericycle) by a blank space, the pericyclic fibres by crossed diagonal lines, the bast fibres by slanted lines, the sieve-tissue and bast parenchyma by dots, the medullary rays by continuous radial or diverging dotted lines, the stone cells by black areas, and the cluster crystals of calcium oxalate by crosses.

Populus Tremuloides, Michx. (Fig. 28). *Locality*, woods by Cascadilla Creek, just south of Dwyer's Dam, Ithaca, N.Y.; collected on March 1, 1902; determined by Professor W. W. Rowlee, Cornell University, Ithaca, N.Y. Cork thin. Cortex rather narrow, with an occasional, usually small, group (up to 79μ in diameter) of stone cells. Collenchyma irregularly and not very copiously developed. Pericyclic fibre groups frequently accompanied by excessively thick bands (up to 223μ) of stone cells, and scantily provided with crystal-containing sacs; fibres never exceeding 26μ (average about 18μ), striated—one of the striations being especially distinct (Fig. 16), and with a tendency to separate and become rounded, middle lamella slightly developed; parenchymatous portion of the pericycle usually with clear cells. The first layer of bast-fibre groups, in conjunction with stone cells that have usually arisen in the expanded parts of the medullary rays, forms a mixed sclerenchymatous ring with only distant and narrow

parenchymatous breaks; the layer next to this internally subsequently behaves in a similar manner, and this process may be continued by the succeeding layers in older barks. The stone-cell aggregations in the first ring may attain as great a thickness as the pericyclic bands, but the fibrous portion of the ring rarely exceeds 170μ. The rings internal to the first, in older barks, are rather thinner, and the fibre groups therein are very irregular in thickness, although they always preserve a strict tangential arrangement. The bast fibres (*b. f.*, Fig. 17) frequently exceed 26μ, and may attain 36μ, exhibit no evident striations, and present a pearly appearance and relatively slender middle lamella. Stone cells (*sc.*, Fig. 17) of every conceivable shape, thick-walled, and ranging from the size of the fibres to 78μ. Medullary rays distinct internally, but not towards the exterior, their one-rowed portions (in older barks than the one sketched) are occasionally lignified between the fibre groups, and may also contain prismatic crystals, but neither occurrence is common. Bast rays not clearly distinguishable externally, owing probably to total collapse of sieve tissue and dilatation of the bast parenchyma. Sieve tubes (*s.t.*, Fig. 26), quite commonly 28μ to 31μ across, apparently empty, elongated in a tangential direction as a rule, and usually juxtaposed tangentially. Bast parenchyma (*b. par.*, Fig. 26), very much smaller and with dense contents, forming thereby a striking contrast with the sieve tubes. Cluster crystals of calcium oxalate occur sparingly in the cortex and outer part of bast.

Note. In a one-year-old twig there is a broken ring of small stone-cell groups in the outer part of the cortex, much as in Fig. 4 (*P. angustifolia*). The pericyclic fibres at this stage very rarely exceed 13μ.

POPULUS ALBA, L. (Fig. 29). *Locality*, Cambridge Botanic Garden; collected on July 23, 1901; determined at the Cambridge Botanic Garden. Cork of approximately the same thickness as the cortex. Cortex very narrow (from 5 to, unusually, 8 cells thick), and consisting mostly of collenchyma; nearly free from stone cells (but a broken ring of stone cells occurs in the one-year-old stem). Pericyclic fibre groups distant, frequently with small groups of stone cells adjoining them, the latter also occurring here and there in other parts of the pericycle; fibre groups scantily provided with crystal sacs. Pericyclic fibres very rarely exceeding, and seldom attaining, 16μ; middle lamella proper very thin and distinctly visible, "middle lamella" (= strongly lignified portion of outer walls) thick; one striation distinctly visible. The bast-

fibre groups in the outermost layer form a nearly continuous mixed stone ring, as in *P. tremuloides*, and where small gaps still occur the cells are sclerotizing (see *sclg.*, Fig. 25). The bands of stone cells may attain a thickness of 144μ, but may thin down to 79μ (or even 52μ) in the outer ring; or less, internally to it. Average thickness of fibre groups is fairly uniformly 79μ, but may be as little as 26μ, or as much as 117μ. Suppression of fibre groups may occur, and connecting bands of stone cells internal to the outermost ring are not formed so soon, as a rule. The bast fibres are of the same type as in *P. tremuloides*, but they do not usually exceed 26μ, although they may attain, but very rarely, 31μ; striations rarely suggested. Stone cells, as in *P. tremuloides*, but tangential elongation, is, perhaps, more frequent. Medullary rays distinct internally, but narrower than in *P. tremuloides* (compare *m.r.*, in Figs. 26 and 27), and fairly well marked externally; with fusiform local expansions; the one-rowed portions occasionally lignified between the fibre groups. The bast rays, though not very sharp, are generally distinguishable throughout their course, owing to the fact that the sieve tubes retain their shape, more or less completely, for a considerable time. The sieve tubes (*s. t.*, Fig. 27) may attain a diameter of 39μ, and may possess scanty contents; they usually exhibit a nearly circular or polygonal outline, and only collapse slowly; sieve plates not distinct. Cells of bast parenchyma (*b. par.*, Fig. 27), of varying sizes, and with irregular and not copious contents. Cluster crystals of calcium oxalate occur but sparingly, and are very rare in the cortex proper and in the inner part of the bast.

POPULUS GRANDIDENTATA, Michx. (Fig. 30). *Locality*, woods by Cascadilla Creek, just below Dwyer's Dam, Ithaca, N.Y.; collected on March 1, 1902; determined by Professor W. W. Rowlee, Cornell University, Ithaca, N.Y. Cork thin. Cortex wide, and invariably with abundant groups of stone cells (up to 260μ thick), which are commonly scattered, but sometimes occur in approximated tangential bands, the latter occasionally attaining 1·26 mm. in a tangential direction; the stone cells themselves are usually, but by no means always, oval or squarish, and do not commonly exceed 52μ (average, about two-thirds of this). Collenchyma feebly and scantily developed. Pericyclic fibre groups very white, isolated, or in mixed sclerotic bands, which may be as much as 1·8 mm. wide in some cases; the stone-cell groups in these bands may attain a thickness of 117μ, and the fibrous portions are of approximately the same thickness—the average thickness of the whole bands is

between 80μ and 100μ. Pericyclic fibres rarely exceed 14μ, and seldom attain them; striations generally absent; "middle lamella" very thick. A mixed continuous stone ring of very unequal thickness is almost invariably formed with the first band of fibres—there is, however, very occasionally, a break in this ring, which in one case observed attained a width of three parenchymatous cells—the stone-cell masses may here attain a thickness of 130μ, while the fibre groups beside them may be only 39μ thick, or, even get down to 26μ; in a word, the stone-cell groups are, as a rule, thicker than the fibre groups, but they may be thin, nevertheless (occasionally as little as 39μ); one of these stone-cell masses was seen which attained a thickness of 233μ in the radial direction, and stretched across two fibre bands, plugging up a medullary ray in a similar way to *P. tremula*. The bast fibres, which are seen to the best advantage in the more regular internal groups, sometimes attain 26μ, commonly 20μ, striations absent, appearance stony, middle lamina slender but sharp. The stone cells are of the usual type. Medullary rays not very distinct, the one-rowed portions with narrow cells much extended radially. Bast rays indistinct. Sieve tubes usually polygonal and nearly isodiametric, but otherwise approaching the *tremuloides* type in their tangential juxtaposition, their emptiness, and their recognizable sieve plates (although the latter are not nearly so distinct as in *P. tremuloides*); they attain, but seldom exceed, 26μ. The bast parenchyma is, for the most part, obviously smaller, and with dense contents. Cluster crystals scarce, but occurring throughout the bark.

Note. In an older piece of bark, containing five layers of bast-fibre groups, the last-named may attain a thickness of 130μ. When the outermost continuous mixed ring shows signs of breaking up—as it occasionally does—the one next to it internally takes its place, as that has become a nearly continuous mixed ring also. There are local fusiform widenings in this older bark, but they are not so frequent as in *P. alba*; sclerotic bands frequently occur in such as are to be found, even between the inner fibre groups which have been separated by these widenings.

P. Canescens, Sm. (Fig. 31). *Locality*, Royal Botanic Gardens, Kew; collected in March, 1901; determined at Kew. Cork fairly thick. Cortex very wide, collenchyma generally feebly developed, but fairly strong locally, especially when stone-cell groups, not far removed from the cork, occur below it. Stone cells very copiously developed (Fig. 24), in small or large groups,

frequently scattered, but commonly approximated in tangential bands which may attain 3·25 mm., and 210μ in thickness. Stone cells (Fig. 24) of very varying shapes and sizes (from 26μ to 105μ). Pericyclic fibre groups usually much broken up, and frequently forming mixed sclerenchymatous bands with stone-cell groups: the latter may be 105μ thick, or occasionally much more, for they are, at times, extremely irregular; the pericyclic groups themselves are seldom more than 65μ thick. The pericyclic fibre groups, when not involved with the stone cells, show few enveloping sacs with prismatic crystals, although more so than in most of the barks. Pericyclic fibres not usually exceeding 16μ, striations evident or not, "middle lamella" of varying thickness. The first layer of bast-fibre groups never forms a continuous mixed ring with stone cells, although bands, up to 1·45 mm. in tangential direction, may occur. The thickness of the bast fibre groups rarely attains 92μ, and seldom exceeds 65μ in the first layer; the groups internal to this, even in old barks, are thinner still, and rarely exceed 52μ. Such stone cells as occur in the bast are either mixed in with the bast fibres and not much wider—these are by no means abundant, and internally to the first layer they are distinctly rare—or else they occur in masses, up to 262μ in diameter, plugging up the medullary rays, or as irresponsible chunks in the soft bast. Occasionally, also, the usual fill-up stone-cell group is found between two fibre groups in the wider part of a medullary ray (as far as this can be determined): the whole arrangement, in fact, is very irregular. Internally, suppression of the fibre groups is very common, some pieces of bark as large as the section drawn showing only about half the number exhibited in the one chosen. The secondary fibres may attain 26μ (quite commonly 24μ), have no obvious striations, and possess a moderately thick middle lamella. Medullary rays very narrow in the one-rowed portions and fairly distinct; both the medullary rays and the bast rays are confused towards the exterior. Soft bast enormously in excess and showing a distinct banding, caused by a regular alternation of bast parenchyma possessing dark granular contents with colourless and usually much collapsed sieve tissue. The quantity of sieve tissue present is relatively very large. Sieve tubes up to 26μ, and of the *tremuloides* type on the whole, except that their mode of juxtaposition shows little regularity; their great abundance and their occurrence in tangential bands are, however, very striking features. The bast parenchyma is smaller, and with dense contents. Cluster crystals

of calcium oxalate are extremely abundant everywhere except in the narrow parts of the medullary rays.

Note. In a piece of older bark the inner bast conforms to what has been said above, but the fibre groups are extremely scarce, and hardly ever more than one fibre thick. The cork may be enormously thick, while in the cortex the formation of stone cells has hardly kept pace with the increase in tangential extension, and the cortex is, on the whole, less sclerotic, and there is, further, a tendency for the groups to get into line and to form a tangential band.

P. Tremula, L. (Fig. 32). *Locality*, Cambridge Botanic Garden, collected on June 3, 1903; determined at the Cambridge Botanic Garden. Cork fairly thick. Cortex wide, collenchyma well developed on the whole, especially outside the stone-cell groups. Stone-cell groups always scattered, and of very varying size—from 79μ to 314μ or more (crossing the pericycle into the outer widened portion of a medullary ray in the latter case). The stone cells in these groups may be very thick-walled, as usual, or the walls may be rather thin. Pericyclic fibres generally in good-sized groups, the latter hardly ever in connection with stone cells, but always clearly at the apex of bast wedges, sacs with prismatic crystals of calcium oxalate fairly abundant on their outer surfaces, but scarce on their inner ones; the pericyclic fibre groups usually attain as great a thickness as the more developed of the bast-fibre groups, and, almost always, a greater tangential extension. The pericyclic fibres may attain 18μ, may be striated or not, and possess a moderately developed middle lamella. Bast-fibre groups, irregular in position and size, the latter factor varying, in the thickness, from 26μ to 118μ, and both these and intermediate sizes are common. The average size (as far as this can be determined) of the bast fibres is not very much greater than that of the pericyclic fibres, but it occasionally reaches 31μ, when the fibres are much extended in one direction; the bast fibres are not evidently striated, and possess a moderately thick middle lamella. The sclerotic groups are most frequently found in the outer parts of, or plugging up the medullary rays (Fig. 23); these masses may attain a radial diameter of 445μ. Small groups of stone cells or single stone cells are also found in the one-rowed parts of the medullary rays, between two bast-fibre groups, and projecting beyond the latter (*sc.*, Fig. 18): this appears to be characteristic. A small group of stone cells is also occasionally affixed to one side of a fibre group in the usual way, but this

is not common; and quite frequently the bast (and the cortex too) is, in some sections, almost free from stone cells, saving the narrow parts of the medullary rays, which are frequently lignified between the fibre groups. Bast rays and medullary rays extremely sharp; bast wedges rather erratic, but frequently broad and well shaped. Sieve-tubes hardly ever attaining 26μ until flattened in a tangential direction; intermediate, perhaps, between the *tremuloides* and *alba* types, but as they collapse early they are not of much descriptive value. Cells of the bast parenchyma frequently quite as large, and not easily distinguishable, at times, from the sieve tubes. Cluster crystals of calcium oxalate abundant, except in the inner part of the bast, where they may also be found in the one-rowed portions of the medullary rays.

P. Balsamifera, L. (Fig. 33). *Locality*, side of road leading to Varna, Ithaca, N.Y.; collected on March 1, 1902; determined by Professor W. W. Rowlee, Cornell University, Ithaca, N.Y. Cork rather thin. Cortex fairly wide, with small groups (up to 262μ in tangential, and 52μ in radial direction) of stone cells few and far between in it. Collenchyma rather slightly developed. Pericyclic fibre groups distinct, up to 118μ thick, strikingly white, and almost free from juxtaposition with stone cells, although an occasional small group is seen; sacs with prismatic crystals of calcium oxalate scarce in connection with the fibre groups. The pericyclic band joining the fibres tangentially generally consists of clear cells. Pericyclic fibres rarely attaining 15μ, and, with a tendency to split apart, striations not obvious, except on borders of groups, middle lamella slender. The first layer of bast-fibre groups may form mixed bands with the stone cells, attaining a width, in some cases, of 1·26 mm., and perhaps more; the fibrous portions of these attain 52μ in thickness, and the stone-cell groups a little more; such a band is then followed by a gap whose width may be as great as that of the band itself. The stone-cell groups usually occupy the normal positions in the widened portions of the medullary rays (as far as this can be determined). The second band from the pericycle, however, very closely approximates to the nearly continuous mixed ring condition which obtains in *P. tremuloides*. This ring may attain a thickness of 79μ (the average is not far from 65μ), and its regularity and evenness form a strong contrast to the two preceding types. The bast fibres may attain 26μ (average perhaps 18μ). Sieve tubes, bast parenchyma, and medullary rays of the *tremuloides* type. The sieve tubes attain, but rarely exceed, 26μ; they apparently collapse earlier than in

P. tremuloides, and their sieve plates are not quite so distinct. Cluster crystals of calcium oxalate rather abundant in cortex, and sometimes in outer bast and medullary rays, but scarce internally to this.

Note. Observations on older and younger barks show that the one-rowed portions of the medullary rays are always bold and wide, but the external portions are never very distinct. The fibrous layers in the inner portions of older barks are, as a rule, perfectly continuous (excepting the medullary rays, of course) and regular. Stone cells may occur occasionally in the fibre bands (or closely approximated to them) toward the exterior, but are comparatively rare. All mixed rings are broken at this stage.

P. ANGUSTIFOLIA, James (Fig. 34). *Locality*, well protected spot on Colorado College campus, growing in sandy soil; collected on March 14, 1902; determined by Mr. H. L. Shantz, Colorado College, Colorado Springs, Colo. Cork thick. Cortex rather wide; collenchyma feebly developed; stone-cell groups usually small (may attain a thickness of 131μ and a tangential extension of 262μ), and distantly arranged in a ring near the outside of the cortex for the most part; somewhat quadrangular or oval thick-walled cells, not generally exceeding 52μ, preponderate in these groups. Pericyclic fibre groups large frequently 288μ in a tangential direction and 105μ thick, but occasionally more broken up) and seldom with stone cells abutting on, or tangentially in line with them; prismatic crystals of calcium oxalate in connection with them very rare. Pericyclic fibres attaining fully 26μ (average probably about 18μ), pearly, without evident striations, middle lamella relatively slender—characters generally associated with the bast fibres: they are, however, very white, and are only faintly stained by phloroglucin and hydrochloric acid. The tangential connecting bands of clear parenchymatous cells are frequently very striking. A mass of stone cells, attaining 288μ tangentially and 210μ radially in one mass measured, occasionally occurs in the widened part of a medullary ray just below the region of the pericycle, but this is quite rare. The first layer of bast-fibre groups is always feebly developed, and, although stone-cell groups up to 131μ wide may occur in it, in the majority of cases the bast wedges are well marked off, owing to the absence of disturbing sclerotic groups; the fibre groups in this layer may attain 52μ in thickness. The second layer more nearly approximates to a continuous mixed ring, but frequent gaps occur, leaving the medullary rays unencumbered, and contributing to their

distinctness; notwithstanding the fact that the stone-cell groups which occur here may attain a thickness of 65μ, whereas the fibrous groups seldom exceed 52μ, the banding presents a regular and orderly appearance. In addition to their occurrence in their normal positions, the stone cells are sometimes found in the bodies of the fibre groups, and also in the one-rowed parts of the medullary rays between two fibre groups, as shown in Figs. 19 and 20. The thickness of the soft bast between the pericyclic fibre groups and the first layer of bast-fibre groups averages from 183 to 235μ, and from 183 to 205μ between the first and the second layers, leaving but about a third of the thickness of the whole bark for the remaining closely-approximated layers. The latter are about 65μ thick on the average (soft bast about 79μ), and are very regular, the fibre groups being hardly ever suppressed. It is true that the fibre groups may now and then attain a thickness much above the average (up to 131μ), but this does not interfere with the great regularity of the tangential banding. The individual fibres answer to the description of the pericyclic fibres with the exception of their behaviour towards hydrochloric acid, while the fibre groups are beset with sacs containing prismatic crystals of calcium oxalate. The medullary rays are noticeable on account of the interesting crystallizations and lignifications which occur in their one-rowed portions (see Figs. 19, 20, and 22); these may occasionally be seen even between the fibre groups of the innermost fibrous layer. The stone cells which occur in these positions generally keep within the slit between the fibre groups, without projecting beyond them as is frequently the case in *P. tremula*; otherwise the medullary rays are well marked, wide-celled, and with dark granular contents. Both the bast rays and the medullary rays are hence recognizable throughout, although the former sometimes lacks sharpness in the outermost portion of the bast. Sieve tubes, bast parenchyma, and medullary rays of the *tremuloides* type, but bast parenchyma relatively large. The sieve tubes are frequently 26μ wide. Sacs containing cluster crystals of calcium oxalate are fairly abundant in the cortex and outer parts of the medullary rays, but scarce elsewhere.

Note. In some sections the third layer of bast-fibre groups from the pericycle is feebly developed, giving, in places, the appearance of a wider band of soft bast.

P. Monilifera, Ait. (*P. deltoides* [*vel deltoidea*], Marsh.) (Fig. 35). *Locality*, Cambridge Botanic Garden; collected on June 3, 1903; determined at the Cambridge Botanic Garden. Cork

thick, occasionally exhibiting tangential bands of stone cells where abnormally developed locally. Cortex rather thin on the average (it is above the average in Fig. 35); collenchyma rather strongly developed; stone cell groups small (attaining 210μ in a tangential, and 131μ in a radial direction), and scattered. Pericyclic fibre groups free; or with bands of stone cells abutting on them from the medullary rays below, but also occurring tangentially in line with them; the former groups may attain a thickness of 79μ, and the latter of 105μ, with a tangential extension of 183μ. The pericyclic fibre groups stain deeply with phloroglucin and hydrochloric acid, but they are sparingly accompanied by sacs containing prismatic crystals of calcium oxalate. Pericyclic fibres rarely exceeding, or even attaining, 16μ; usually with a conspicuous middle stria; middle lamella slender. First layer of bast-fibre groups averaging about 52μ, not infrequently banded by means of stone-cell groups stretching across the rather ill-defined medullary rays in the usual way; such stone-cell groups, however, are rather fitful in their appearance, and these mixed bands, whose average thickness is about 52μ, are seldom of much extent. The fibrous layers internal to this do not certainly average more than half the thickness of the preceding, and fibre groups are frequently suppressed, as in *P. canescens*. It is rare to find groups of stone cells further inward than the second layer of fibre groups, but small masses scattered here and there occasionally occur. The bast fibres are of the usual type, and may occasionally attain 26μ (commonly 23μ), the average dimensions are probably about 18μ. The medullary rays are narrow in their one-rowed portions, and never very distinct at any part of their course; but towards the exterior, the irregular groups of stone cells and the crowded cluster crystals of calcium oxalate contribute, with other factors, to make a separation of bast rays and medullary rays a matter of impossibility. The general facies of the soft bast is much like that of *P. tremula*. The cells of the bast parenchyma are distinctly smaller than the sieve tubes, but they soon swell out to the same size as the latter, which collapse early. The sieve tubes frequently attain a diameter of 26μ; sacs containing cluster crystals of calcium oxalate abundant in cortex and outer parts of medullary rays, which are almost black with them; also very abundant in the remainder of the bast, and not infrequently occurring in the narrow parts of the medullary rays.

P. Pyramidalis, Salisb. (*P. nigra*, var. *Pyramidalis*, Spach; *P. italica*, Moench.), (Fig. 36). *Locality*, Cambridge Botanic

Garden; collected on July 23, 1901; determined at the Cambridge Botanic Garden. Cork thick, excessively developed locally, and frequently with tangential rows of stone-cells in these local developments. Cortex fairly wide; collenchyma slightly developed; abundance, size, and distribution of stone-cell groups much as in *P. deltoides*, but may occasionally attain an irregular tangential extension of 360μ, and a similarly irregular radial diameter of 180μ, but so slight a difference as this is of no importance, and the great majority of sclerotic groups are no larger than in *P. deltoides*. The pericyclic fibre groups are usually much broken up (a large size for a fibre group is 157μ wide by 65μ thick), and, as a rule, are tangentially in line with groups of stone cells of approximately the same thickness, and not infrequently in juxtaposition with them. Pericyclic fibres rarely exceeding 13μ (7 to 10μ common); one striation, at least, discernible; "middle lamella" usually thick, and thin middle lamella proper occasionally visible also; these fibres stain deeply with phloroglucin and hydrochloric acid. The average thickness (about 39μ) of the layers of bast-fibre groups is pretty nearly the same throughout the bark, although it may range from 16μ to 52μ. The first layer externally does not seem to show the preponderance in size over the others which appears to be general in *P. deltoides*. I have observed small groups of stone cells, up to 65μ thick, in the three outer layers; they are usually affixed to the bast-fibre groups in the usual way, but whether they arise in the widened medullary rays or not is difficult to determine. The tangential banding of the bast-fibre groups appears to be much more regular than in *P. deltoides*, suppression of fibre groups being less frequent than in the latter species, and the gaps do not often exceed 360μ in a tangential direction; these gaps, by the way, do not appear to be governed by the medullary rays, a fact which adds to the difficulty of recognizing the outlines of the bast rays if such be present. The bast-fibres very rarely attain 20μ, and seldom exceed 16μ; they are of the usual type, but striations are sometimes suggested. The medullary rays are irregular in their course and not easy to follow; the cells of which they are composed are narrow, and not much elongated radially; they have, further, a tendency to become extended tangentially, and to mingle with the bast parenchyma. The bast rays are equally indefinite. The sieve tubes may rarely attain 29μ, and exceed the cells of the bast parenchyma in size; they approach the *tremuloides* type, but tangential elongation is not adhered to, their greatest extension being frequently in a radial or oblique direction.

They are subject to early distortion and collapse, and much exceed the parenchyma in amount. Cluster crystals of calcium oxalate are extremely abundant throughout the bark.[1]

Note. From what has been said above, it will have been gathered that the greatest similarity exists between this bark and that of *P. deltoides*.[2] The differential characters which seem to possess some degree of constancy are: (1) The greater relative thickness in *P. deltoides* of the first layer of bast-fibre groups with respect to those internal to it, and the more frequent addition to it of stone-cell groups, and (2) the less frequent suppression of bast-fibre groups in *P. pyramidalis*.

P. Nigra, L. (Figs. 37 and 38). *Locality*, Royal Botanic Gardens, Kew; collected in March, 1901; determined at Kew. Cork fairly thick. Cortex usually somewhat narrow, but rather variable in this respect; collenchyma fairly well developed; groups of stone cells are present, but they are not very abundant and seldom exceed 180μ, although they may occasionally attain 235μ in a tangential direction; stone-cell groups are relatively less abundant in the older barks, inasmuch as their formation does not keep pace with the growth in extent of the cortex. The pericyclic fibre groups may be broken up (as in Fig. 37), or they may be intact and of considerable size (Fig. 38): the number of sacs with prismatic crystals occurring in connection with them is relatively small; they are, as a rule, entirely free from stone cells, but a group of the latter, usually smaller than they (and certainly always thinner than the larger ones) may be attached to them. The pericylic fibres very rarely exceed 13μ, but may, nevertheless, occasionally attain 16μ; striations not evident; middle lamella thin. The layers of bast-fibre groups usually show a very regular tangential banding (Fig. 38), although fibre groups may be suppressed here and there, especially in the younger barks (Fig. 31); they are always narrow, the average thickness being about 26μ (as in Fig. 21), and the extremes 39μ and 13μ (the thickness of a fibre). Occasionally a stone cell or two is found in the fibre groups (*s. c.*,

[1] The expression, "throughout the bark," which has been repeatedly used in connexion with the distribution of cluster crystals of calcium oxalate, does not include the cork, which has been disregarded in the consideration of these bodies.

[2] I have used this name in preference to "*P. monilifera*" throughout the descriptions, as it (or its variant "*P. deltoidea*") is the one by which the tree is generally known. It is, of course, not within our present purpose to enter into the question of its merits or demerits from the standpoint of rigid botanical nomenclature.

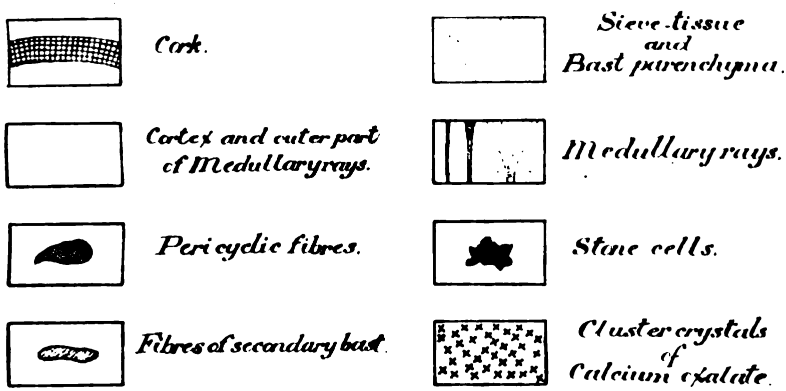
Fig. 21), but this is not at all common. The bast fibres are of the usual type, and rarely exceed 13μ, although they may attain 16μ or even more. Scattered groups or bands of stone cells occur now and then in the widened portions of the medullary rays; the bands usually occur in connexion with the first or second layers of bast-fibre groups, and may attain a thickness of as much as 78μ, but rarely exceed 52μ. Stone cells, however, are less abundant in this bark than in any of the others. The widened medullary rays and the bast wedges are distinctly marked off from each other externally. The one-celled portions of the widened medullary rays, but particularly those medullary rays which traverse the bast wedges and widen little, or not at all, are broad, distinct, and sharp; the cells of the unexpanded portions of the medullary rays, or all the cells of those medullary rays which do not expand, are markedly elongated radially. The bast wedges are wide as a rule, but not always; sieve tubes rarely attaining 26μ, and seldom over 23μ, of the *tremuloides* type, but relatively more numerous. The cells of the bast parenchyma, although less numerous than in *P. tremuloides*, are relatively larger; cluster crystals of calcium oxalate abundant, more especially in the outer parts of the bark.

P. Fremonti, S. Wats. (Fig. 39.) *Locality*, loamy, somewhat damp soil, San Bernardino, Southern California, collected on February 24, 1902, determined by Mr. S. B. Parish, San Bernardino, Cal. Cork thin, characterized by the presence of concentric rows of stone cells at more or less regular intervals which induce exfoliation of its outer layers. Cortex usually wide, but somewhat irregular; collenchyma little developed; stone-cell groups irregular, rather numerous, scattered, and frequently of considerable size, attaining 270μ in any direction. Pericyclic fibre groups usually small and free, but with an occasional, generally smaller, group of stone cells abutting laterally upon them; they are only sparingly accompanied by sacs with prismatic crystals of calcium oxalate. Pericyclic fibres rarely exceed 16μ, apparently not striated, and with a thin middle lamella. The external bast-fibre groups are clearly limited to the very distinct bast rays, and are usually rather thick (about 78μ on the average), and irregular in their distribution; the inner groups are more regularly arranged, and tangential banding is general, although the bands are generally crooked. Bast fibres of the usual type, sometimes attaining 26μ, and commonly 23μ. Masses of stone cells occur here and there in the widened outer parts of the medullary rays, but these hardly ever show any tendency to unite with the bast-fibre groups.

Salicaceae.

- **Populus.** Stone cells invariably present in the bast. Periderm never possessing cells whose walls are thickened on the outer side only, these thickenings being suberized, but not lignified.
  - Forms in which layers of bast-fibre groups form nearly continuous mixed rings with stone-cell groups in the first or second layers from the pericycle; and with few crystals of calcium oxalate in the inner part of the bast.
    - Extensive mixed sclerenchymatous bands in the pericycle.
      - Narrow cortex with little sclerenchyma. *P. tremuloides.*
      - Wide cortex with much sclerenchyma. *P. grandidentata.*
    - Mixed sclerenchymatous bands in pericycle rarely developed.
      - Outermost layer of bast-fibre groups combining to form a nearly continuous mixed ring with stone cells. Cluster crystals rare in cortex. *P. alba.*
      - Outermost layer of bast-fibre groups never combining to form a nearly continuous mixed ring with stone cells. Cluster crystals abundant in cortex. *P. balsamifera.*
  - Forms in which nearly continuous mixed sclerenchymatous rings in either of the two outer layers of bast-fibre groups and paucity of cluster crystals in inner portion of bast do not occur together.
    - Stone cells in abnormal positions. Medullary rays and bast rays very sharply marked off and cluster crystals fairly abundant in inner parts of bast rays.
      - Concentric rows of stone cells present in cork. No abnormal sclerotic developments in the medullary rays. *P. fremonti.*
      - No concentric rows of stone cells in cork. Medullary rays abnormally sclerotized. *P. tremula.*
    - Stone cells in abnormal positions, sharp bast and medullary rays and fairly abundant cluster crystals in inner parts of bast rays do not occur together.
      - One-rowed portions of medullary rays broad and distinct.
        - Groups of bast fibres in closely approximated bands internally. Groups commonly 65μ thick. *P. angustifolia.*
        - Groups of bast fibres not uncommonly suppressed internally. Groups rarely over 40μ thick usually about 21μ. *P. nigra.*
      - One-rowed portions of medullary rays narrow or indistinct.
        - Cortex excessively sclerotic, bands may attain a tangential extension of 3·25 mm., and a thickness of 210μ. *P. canescens.*
        - Cortex only moderately sclerotic, aggregations of stone cells, not above 200μ in tangential direction and 105μ in thickness.
          - First layer of bast-fibre groups usually twice the size of those internal to it. Suppression of bast-fibre groups extensive. *P. deltoides (P. monilifera, Ait.)*
          - First layer of bast-fibre groups not normally much exceeding in size those internal to it. Tangential banding of fibrous layers well marked. *P. pyramidalis.*
- **Salix.** Stone cells invariably absent from the bast. Periderm always possessing cells whose walls are thickened on the outer side only, these thickenings being suberized, but not lignified.

Conventional signs:



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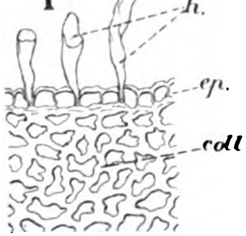

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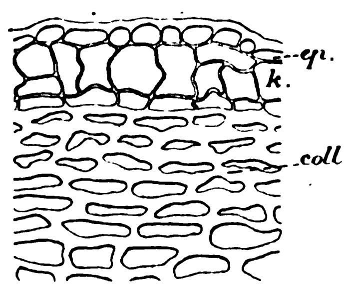

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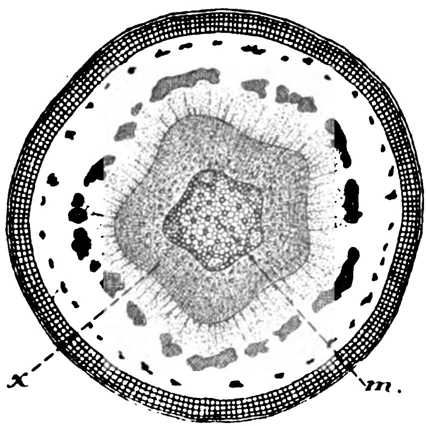

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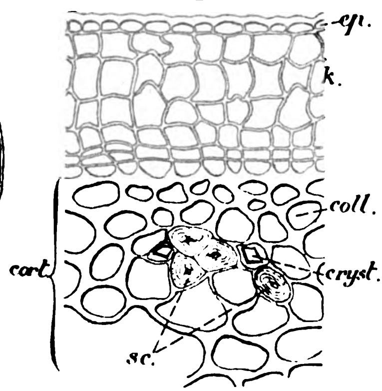

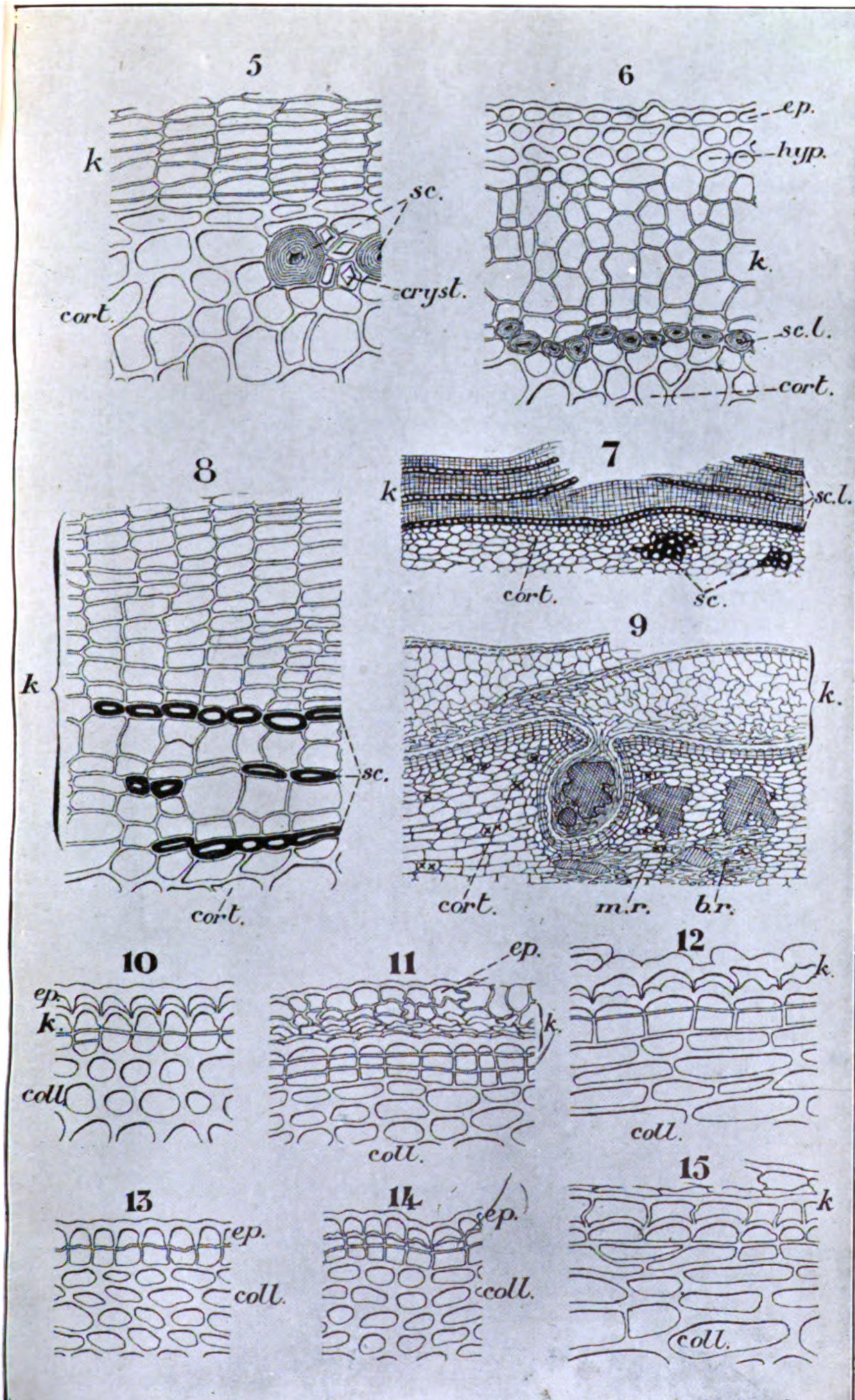
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sc.l.
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9
k.
cort.
m.r.
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10
ep.
k.
coll.
11
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coll.
13
ep.
coll.
14
ep.
coll.
15
k
coll.

The medullary rays are distinct, numerous, and with notably wide cells throughout, which are radially elongated in their one-rowed portions. Bast rays very sharply delimited, owing to the relatively small size of their cells; clearly wedge-shaped, though irregular. Sieve tubes very rarely more than 20μ in their widest parts and nearly always radially juxtaposed; they are not appreciably larger than much of the bast parenchyma, and there is a tendency towards an arrangement of both sieve tubes and parenchymatous cells in radial rows. Cluster crystals of calcium oxalate are abundant in most regions of the bark, as a rule, but their distribution is at times erratic and local; they are commonly most abundant near the outer margin of the medullary rays and bast wedges.

Note. This bark should probably have been placed somewhere near *P. tremula*, but the constant presence of thickened rows of cells in the periderm tempted me to place it as near the willows as possible, that is to say, at the least sclerenchymatous end of the series.

It now remains to construct a key for the series of barks above described, and a chart on the opposite page is an attempt in this direction.

In conclusion, I desire to express my very hearty thanks to the following gentlemen who have taken great pains to supply suitable authentic material for this investigation: Professor I. B. Balfour, F.R.S., Regius Keeper of the Royal Botanic Garden, Edinburgh; Mr. B. F. Bush, Courtney, Mo., U.S.A.; Mr. Frederick V. Coville, Chief of the Division of Botany, United States Department of Agriculture, Washington, D. C.; Mr. E. M. Holmes, F. L. S., Curator of the Museums of the Pharmaceutical Society of Great Britain; the Director, Royal Botanic Gardens, Kew; Mr. R. Irwin Lynch, A.L.S., Curator of the Cambridge Botanic Garden; Mr. S. B. Parish, San Bernardino, Cal., U.S.A.; Professor W. W. Rowlee, Cornell University, Ithaca, N.Y., U.S.A.; Mr. H. L. Shantz, Colorado College, Colorado Springs, Colo., U.S.A.; and Professor William Trelease, Sc.D., Director of the Missouri Botanical Garden, St. Louis, Mo., U.S.A.

Explanation of Figures.

Note.—All the sections are *transverse* sections.

Plate I.

Fig. 1. Section through epidermis and outer portion of cortex of first year's twig of *P. alba*; *h.*, hairs; *ep.*, epidermis; *coll.*, collenchyma. × 200 diameters.

FIG. 2. Section through a somewhat older twig of same; *k.*, periderm or cork. Other lettering as before. × 200 diameters.

FIG. 3. Section through outer part of bark of a one-year-old twig of *P. angustifolia* (that shown in Fig. 4); *cort.*, outer portion of cortex; *sc.*, stone cells; *cryst.*, prismatic crystals of calcium oxalate. Other lettering as before. × 200 diameters.

FIG. 4. Section through a one-year-old twig of *P. angustifolia*; *x.*, wood; *m.*, pith. For explanation of other structures see conventional signs. × 30 diameters.

PLATE II.

FIG. 5. Section through periderm and outer part of cortex of older bark of *P. angustifolia.* Lettering as before. × 200 diameters.

FIG. 6. Section through a one-year-old twig of *P. fremonti*; *hyp.*, hypoderma; *sc.l.*, sclerenchymatous layer limiting cork internally. Other lettering as before. × 200 diameters.

FIG. 7. Section through periderm and outer portion of cortex of older bark of same; *sc.l.*, concentric sclerenchymatous layers in periderm. Other lettering as before. × 75 diameters.

FIG. 8. Section through a copiously developed periderm of *P. deltoides*; *sc.*, tangential bands of stone cells in the periderm. Other lettering as before. × 200 diameters.

FIG. 9. Section through outer part of bark of a two-year-old twig of *S. wardi*; *k.*, outer bark; consisting largely of cork; *m.r.*, medullary ray; *b.r.*, bast ray. Other lettering as before. For structures not lettered see conventional signs on Plate I. × 75 diameters.

FIG. 10. Section through outer part of bark of *S. alba.* Lettering as before. × 200 diameters.

FIG. 11. Section through outer part of bark of a one-year-old twig of *S. wardi.* Lettering as before. × 200 diameters.

FIG. 12. Section through outer part of an older bark of *S. purpurea.* Lettering as before. × 200 diameters.

FIG. 13. Section through outer part of bark of a first year's twig of *S. viminalis.* Lettering as before. × 200 diameters.

FIG. 14. Section through different part of the same twig. Lettering as before. × 200 diameters.

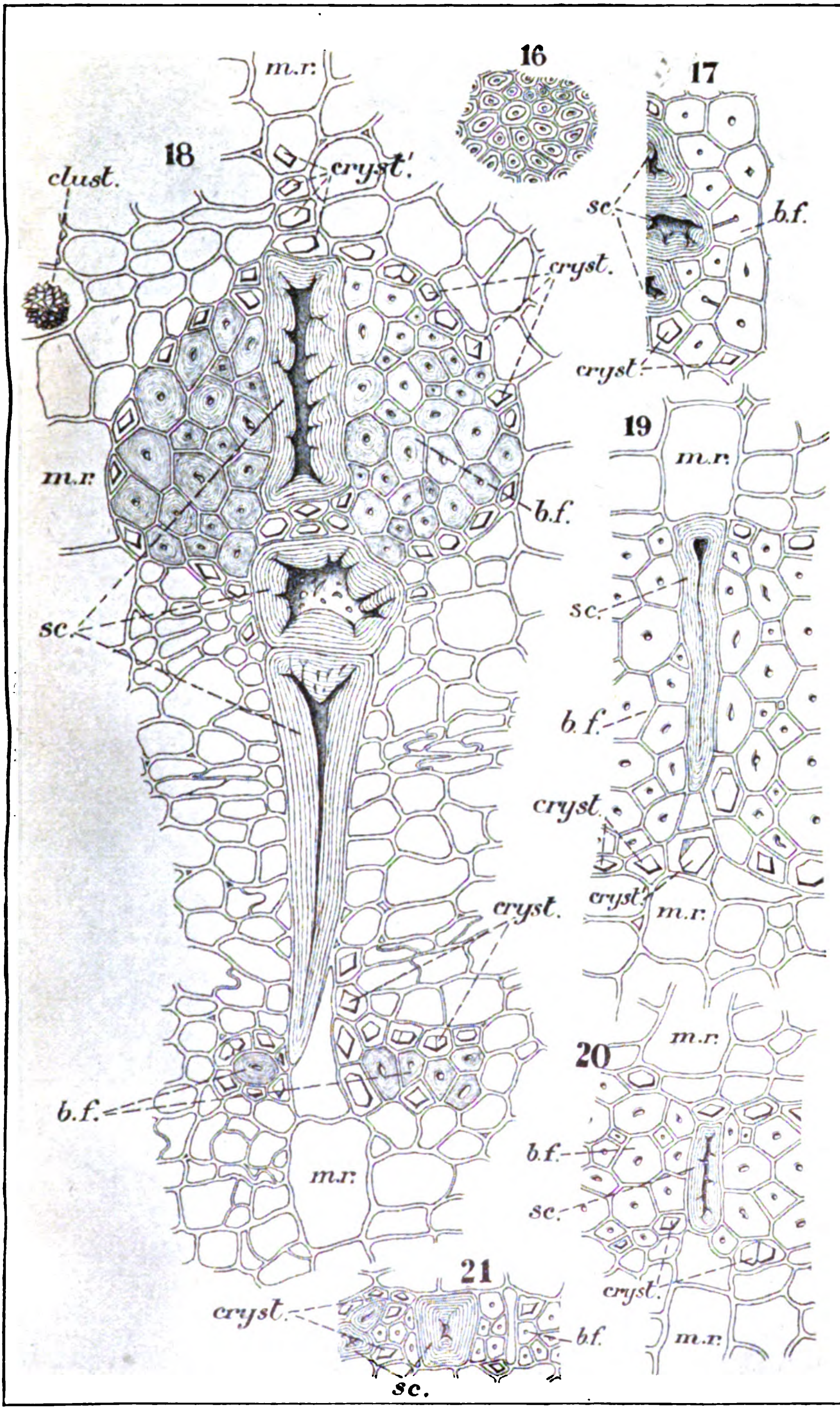
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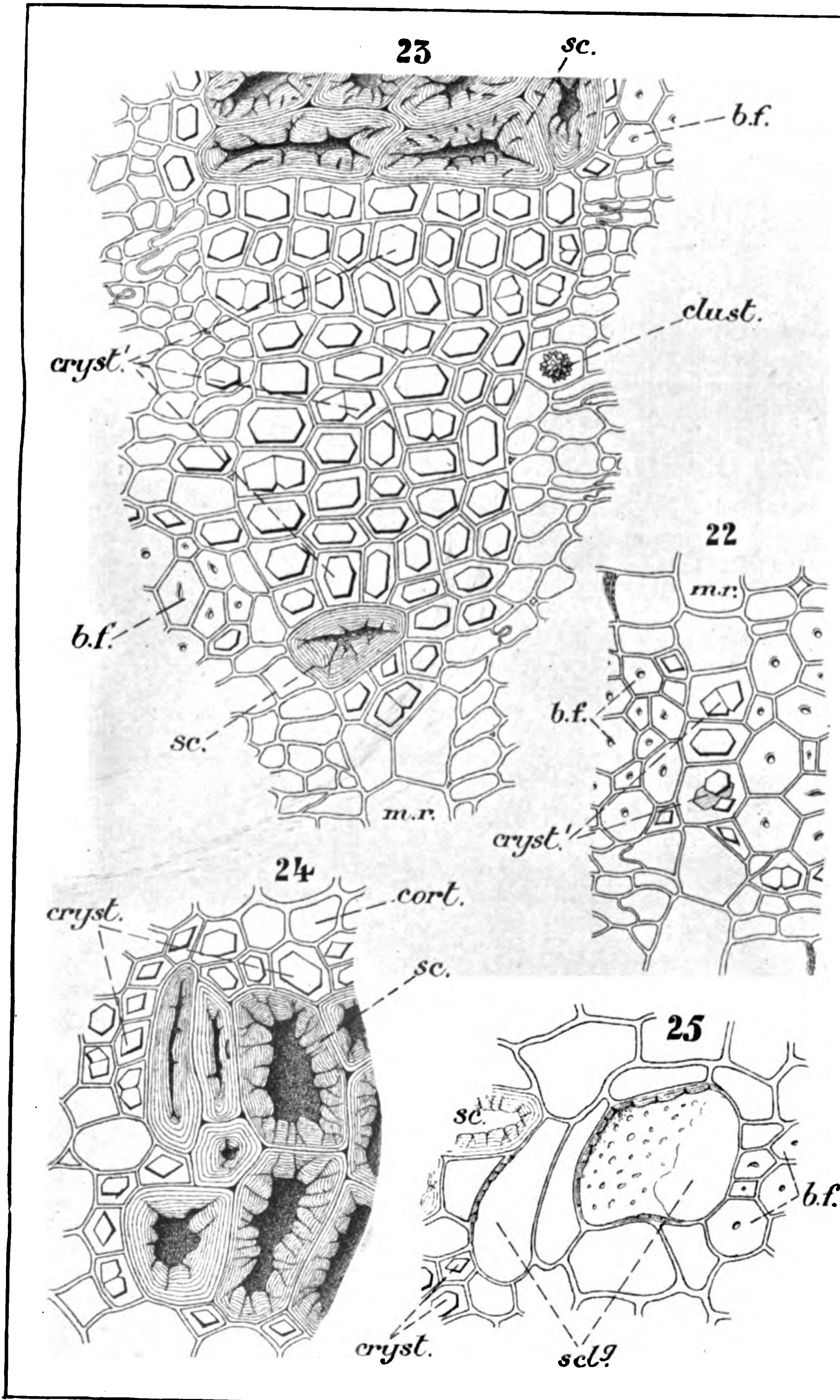
PLATE IV.


23
sc.
b.f.
clust.
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m.r.
22
m.r.
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24
cryst.
cort.
sc.
25
sc.
b.f.
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FIG. 15. Section through outer part of older bark of same species. Lettering as before. × 200 diameters.

PLATE III.

FIG. 16. Pericyclic fibres of *P. tremuloides*. × 300 diameters.

FIG. 17. Section through portion of mixed sclerenchymatous ring of *P. tremuloides*; *b.f.*, bast fibres. Other lettering as before. × 300 diameters.

FIG. 18. Section through portion of bast of *P. tremula*, showing abnormal development of sclerenchyma (*sc.*); *cryst'.*, prismatic crystals of calcium oxalate in medullary rays; *clust.*, cluster crystals of calcium oxalate. × 380 diameters.

FIGS. 19 and 20. Sections through lignified parts of medullary rays between fibre groups in *P. angustifolia*. Lettering as before. × 380 diameters.

FIG. 21. Section through bast-fibre groups enclosing stone cells in *P. nigra*. Lettering as before. × 380 diameters.

PLATE IV.

FIG. 22. Section through part of medullary ray of *P. angustifolia*, provided with prismatic crystals of calcium oxalate between two bast-fibre groups. Lettering as before. × 380 diameters.

FIG. 23. Section through a sclerotic mass from a medullary ray of *P. tremula*. Lettering as before. × 380 diameters.

FIG. 24. Section through portion of a stone-cell group from the cortex of *P. canescens*. Lettering as before. × 380 diameters.

FIG. 25. Section through part of bast of *P. alba*, showing cells in the process of becoming sclerotized (*sclg.*). Other lettering as before. × 380 diameters.

PLATE V.

FIG. 26. Section through portion of soft bast of *P. tremuloides*; *s.t.*, sieve tubes; *s.p.*, sieve plate; *s.w.*, partition between adjoining sieve tubes not showing sieve plate; *b.par.*, bast parenchyma. Other lettering as before. × 380 diameters.

FIG. 27. Section through portion of soft bast of *P. alba*. Lettering as before × 500 diameters.

FIG. 28. Section through bark of *P. tremuloides*. × 28 diameters. Conventionalized. For explanation see Plate I.

FIG. 29. Section through bark of *P. alba*. × 28 diameters. Conventionalized as before.

FIG. 30. Section through bark of *P. grandidentata*. × 28 diameters. Conventionalized as before.

FIG. 31. Section through bark of *P. canescens*. × 28 diameters. Conventionalized as before.

PLATE VI.

FIG. 32. Section through bark of *P. tremula*. × 28 diameters. Conventionalized as before.

FIG. 33. Section through bark of *P. balsamifera*. × 28 diameters. Conventionalized as before.

FIG. 34. Section through bark of *P. angustifolia*. × 28 diameters. Conventionalized as before.

FIG. 35. Section through bark of *P. deltoides* (*P. monilifera*, Ait). × 28 diameters. Conventionalized as before.

FIG. 36. Section through bark of *P. pyramidalis*. × 28 diameters. Conventionalized as before.

FIG. 37. Section through bark of *P. nigra*. × 28 diameters. Conventionalized as before.

FIG. 38. Section through older bark of same. Cluster crystals of calcium oxalate not shown. × 28 diameters. Conventionalized as before.

FIG. 39. Section through bark of *P. fremonti*. × 28 diameters. The darkest lines in the cork are the rows of stone cells, otherwise conventionalized as before.

WILLOWS USED IN PHARMACY.

BY E. M. HOLMES, F.L.S.

Comparatively little information concerning willow bark is found in works on materia medica, and still less concerning the varieties from which salicin is commercially obtained. The recent investigation by Dr. Jowett showed that the percentage of this substance varies considerably according to the time of year at which the bark is gathered, and even according to the sex of the tree. A recent trial in a court of law showed that *S. fragilis* is the species that is generally used for the manufacture of salicin, although other species, especially those allied to *Salix purpurea* yield a large percentage of it. The fact that bark, after keeping, or if not carefully harvested, yields very little salicin, was also stated. But the fact that the bark is usually imported instead of being obtained from the fenny districts of England and Scotland,

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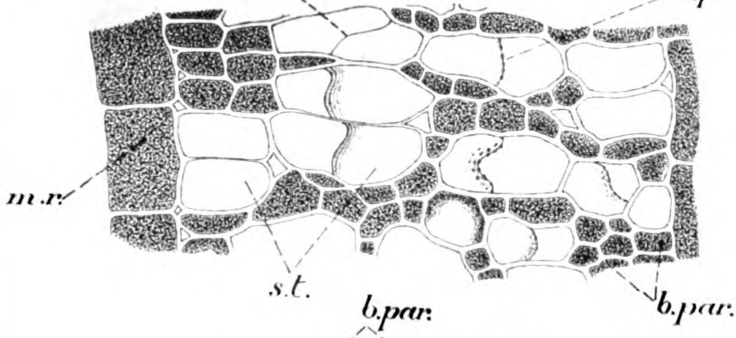

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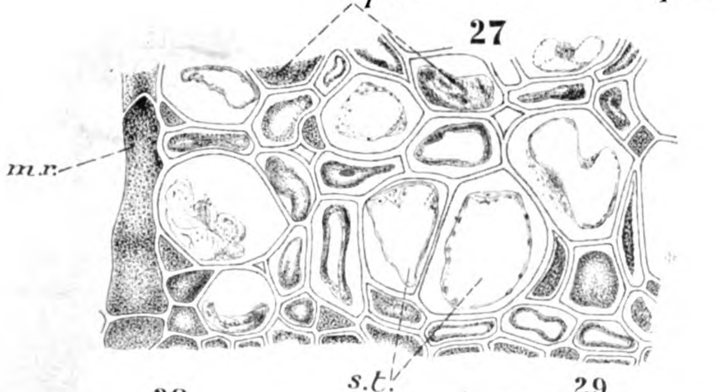

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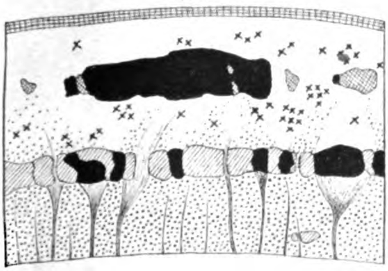

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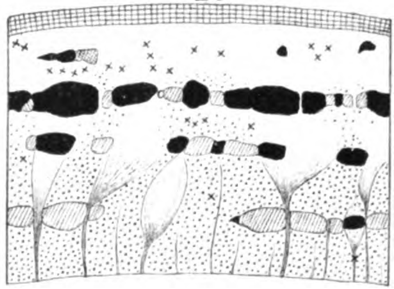

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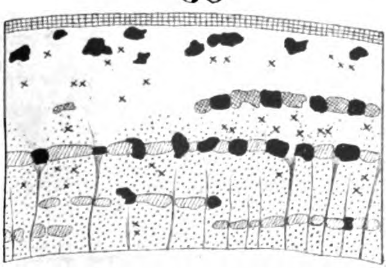

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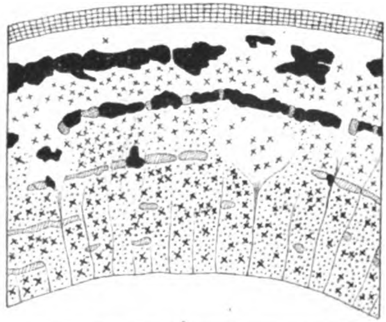

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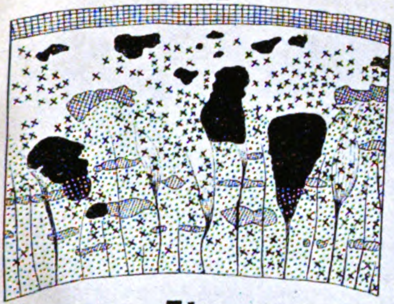

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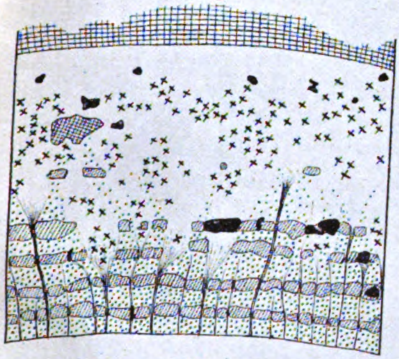

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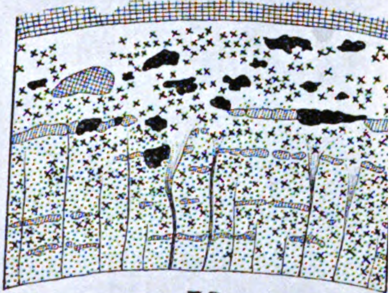

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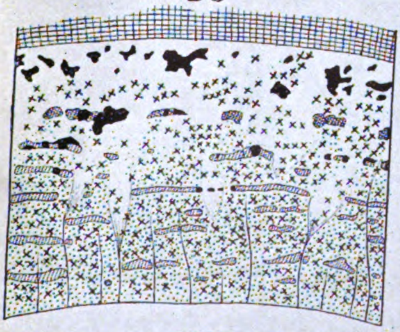

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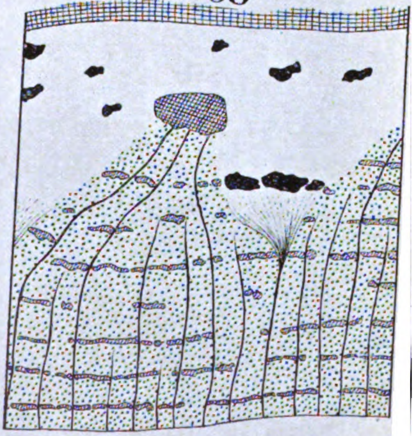

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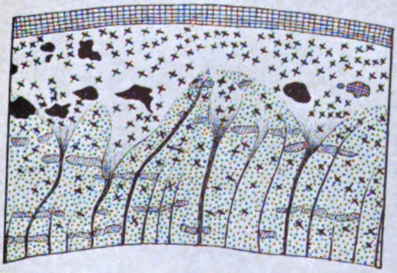

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led me to inquire why the bark containing salicin is not available in this country. Although my inquiries have not yet produced so satisfactory a result as I could wish, some of the information that I have obtained seems of sufficient general interest to bring before the members of the Conference. In the first place I found that growers of willows for basket manufacture cultivated a large number of varieties, which they knew only by trade names, and are as a rule ignorant of the botanical species to which they belong. In the second place the shoots are usually cut down every year, if required for basket or chair making, or every two years if required for splitting to make bands for casks, etc. As the plants rarely flower until they are three years old or more, there is little chance of identifying them botanically unless they are cultivated in a garden. It will be readily understood, therefore, that it is a matter of some difficulty to ascertain what are the botanical species or varieties actually under cultivation in this country.

The character of the stipules, the mode of growth, and the serration and pubescence and shape of the leaves, are the only guides available, and these are by no means so useful as might be supposed, since they vary according to circumstances, the shape of the stipules being alone the best indication of the species. Stipules, however, are not always present. Different species of the genus *Salix* are known respectively as willows, osiers, and sallows. The term willow is generally applied to the species that form trees even when they are pollarded close to the ground, and grown as shoots or osiers, 6 to 9 feet long. The name osier is especially applied to forms and hybrids of the species *S. viminalis*, which grow readily into long rods or shoots almost without lateral branches. The name sallow is given to willows that have a shrubby growth, and more or less broad downy leaves.

WILLOWS.

The tree willows in cultivation are three in number, as follows:—

S. alba. The white willow. This is the species usually allowed to form a trunk about 8 feet high, and then pollarded. It is common along the banks of canals and ditches in marshy land, and the leaves have a white silvery appearance. The heartwood of the trunk is tough and not easily indented, and white, hence its very appropriate name. Mr. A. T. Maw tells me that the wood is used for making wooden legs and chip boxes, such as are used in pharmacy. These latter are made in Hamburg, where the wood

is cut up in factories, and served out to workpeople, who make the boxes in their own homes. Probably this accounts for the fact that they are made cheaper in Germany than in England. The wood of the white willow is also in considerable demand for making cricket bats, and of late years has become so scarce (being worth about 5*s.* per square foot) that the demand is greater than the supply. This is possibly owing to the fact that when the trees are pollarded they soon rot and become hollow, which they do not so readily do when allowed to grow naturally.

S. fragilis. This is now commonly called the crack or snap willow, because in spring-time a slight pressure causes the branches to break off from the stem. Although a marked feature in this species, *S. fragilis* is by no means the only species in which it occurs. The wood of the tree is red, hence it was formerly called the red willow, but that name has quite gone out of use in botanical works in this country. This has led to some confusion concerning the plant, since the name of *S. rubra* has been given to a hybrid between *S. purpurea* and *S. viminalis.* The name of red willow bark is, however, still retained to some extent in trade usage in Belgium, where the name "rood scorce"—i.e., red bark—is locally applied to the bark of the red willow.

S. triandra. This willow and its hybrids and varieties is the principal one grown in this country in the form of shoots or osiers for white basket-work. A large number of varieties are known under different names, but are generally distinguished as willows.

Osiers.

S. viminalis. This is considered as the type of the osiers. The leaves are long, very tapering, rolled back slightly at the edge, and white and downy beneath; whilst those of *S. triandra* have a green appearance, and are neither silvery nor white. The true osiers are chiefly used for hampers and brown wicker work, and are not usually peeled.

S. vitellina. This species is readily recognized by the bright yellow colour of the bark of the annual shoots. It is chiefly sold for binding purposes—i.e., as a withy—in horticulture and agriculture, thousands of bundles being annually used by the market gardeners near London for binding celery and other vegetables, and by florists for binding packages of rose and fruit trees, etc.

S. vitellina is sometimes regarded by botanists as a form of *S. alba*, but it has not, like that species, been found to contain salicin.

S. purpurea. The typical plant is a bush, with branches spreading downwards, and forms only comparatively short shoots. A hybrid of this species with *S. viminalis*, known as *S. rubra*, has, however, upright long shoots, and is one of the finest, toughest, most pliable osiers, and one of the whitest when peeled. This hybrid, and other forms of *S. purpurea*, are used on the Continent in France, Belgium, Italy, and Austria for the finest fancy basket-work. The osiers are generally peeled, and as the bark contains a large proportion of salicin, it has also some value. All the varieties of this species have the leaves nearly opposite and stipules, if any, small and linear; they are usually absent in the typical form of the species. This species is apparently not much cultivated in this country, probably because the osiers are liable to give off side twigs, or roughs, which in Belgium are removed by hand labour, to which the British workman seems averse.

S. acutifolia, known as the Russian or Caspian willow, is a very quick-growing species, which produces long rods suitable for basket-work chairs, and is grown more freely on the Continent than in this country. It is easily recognized by its purplish-black bark, furnished with a whitish-waxy bloom.

S. pentandra. A broad leaved, fragrant species growing wild in the north of England, is sometimes used in Yorkshire for coarse basket work.

So far as I have been able to ascertain hitherto, the large proportion of willows grown in this country are derived from *S. viminalis* and its varieties for hampers and work made of unpeeled osiers, and from *S. triandra* and its varieties for work made from peeled osiers, the finest quality of peeled osiers being imported from the Continent. For the manufacture of salicin *S. viminalis* and *S. vitellina* are of no consideration, since they are not known to contain salicin, and the osiers are not peeled, so that the bark is not a waste product. *S. triandra*, although the osiers are usually peeled, does not afford salicin, so that its bark has no value for that manufacture. *S. pentandra*, which contains salicin, is not usually peeled, and neither *S. purpurea* nor *S. rubra*, nor *S. fragilis* appear to be grown to any extent in this country.

The bark obtained for the manufacture of buff rods, which are so largely used for chairmaking and brown hand-baskets, is of no value, since the rods are dyed by boiling them before removing the bark for eight or nine hours, so that any salicin they might contain would be in the water in which they are boiled.

The osiers, or long shoots from the truncated stocks, are generally

cut in autumn, so as to give the stumps time to heal. The osiers are then placed in ditches till April, May, or June, when those that are intended for white or buff basket-work are peeled. Salicin being soluble in water, the bark naturally loses some in this way, and if the bark is allowed to be rained upon whilst drying it loses more. Apparently, also, it loses salicin by keeping, since manufacturers state that bark kept for two years contains less salicin. This may be due to an oxydase or other ferment, but the cause of it has not, so far as I am aware, been ascertained by experiment. Growers of osiers do not as a rule trouble to separate the barks of different osiers, so that the possibility of getting bark containing salicin with the greatest possible percentage can only be attained by getting the fresh bark on the spot and treating it chemically at once. This consideration has, I am told, led to a combination of manufacturers setting up chemical works close to the area of production in Belgium.

I have not yet been able to ascertain the whole of the names applied to the varieties cultivated in this country, nor to see more than a comparatively small number of the plants, so that I am not able to give at present definite evidence as to the salicin yielding species in cultivation, nor the extent to which they are cultivated. This I hope to be able to do on a future occasion. It may, however, serve to show the number of varieties that exist if I quote a few that were botanically identified at Kew a few years ago, by growing the twigs until they produced flowers.

S. triandra. The male plant included varieties known as Black Hollanders, Old Black (new kind), French Osier, Green Sucklings; and the female plant, Black Mauls, Molds, or Mules, Glibskins, and Jelstivers.

S. purpurea. Welsh osier; var. *Forbyana*, fine basket osier; var. *rubra*, green box osier.

S. fragilis, var. *decipiens.* Mottled Spaniards. I have a number of willows and osiers with their trade names under cultivation, and when they have flowered, I hope to be able to identify them botanically, and to get them examined as to their yield in salicin.

My special thanks are due to the following gentlemen for information and specimens: Dr. M. T. Masters, F.R.S., Dr. H. van Heurck, Director of the Botanic Gardens, Antwerp; Dr. M. Greshoff, Haarlem; Mr. R. F. Lynch, Botanic Gardens, Cambridge; Mr. J. Martindale, Staveley, Westmorland; and the following gentlemen connected with willow-growing and basket-making:

Mr. W. Allan, of Messrs. W. T. Ellmore & Sons, Leicester; Mr L. G. Cooper, West Rasen, Lincolnshire; Mr. G. Musgrave, Stoke St. Gregory, Somerset, and Messrs. J. Plater & Son, Birmingham.

The two foregoing papers gave rise to the following discussion:—

Mr. HOLMES said the important papers that had been prepared by Mr. Perrédès on several occasions illustrated the value of the training he had received at 17, Bloomsbury Square in microscopic work, and he thought the School of Pharmacy ought to be congratulated on having turned out such a capable worker. Since writing his own paper on the "Willows used in Pharmacy" he had received a communication from Mr. John J. Plater, willow merchant, of Birmingham, who stated that the best quality of osiers grown in the United Kingdom are known to the trade as black mauls, long skins, Spaniards, Germans, French, stone, new kinds, and red buds, the latter the toughest of all. The secret of osier growing being a dying industry in some parts of this country was that farmers are as a rule dilatory in the planting, do not keep the beds clean, leave the weeds to race with the osiers, and when they bundle the rods up for market they send them away in such a condition that traders buy thousands of bundles abroad at a higher price simply because they are tied up carefully in uniform sizes and made more marketable at this end. For instance, within the last fortnight Mr. Plater's firm had had over 4,000 bundles of rods delivered to their works, grown at various distances within 100 miles of Birmingham, the bulk of which had reached them in a very loose condition, in so much that the firm had to send men to the railway station to tie them up properly into bundles before the railway company's servants could take them out of the trucks and load them on wagons. Willows consigned to his firm from France, Germany, Holland, Belgium, and Madeira were delivered tight and trim, notwithstanding the many times of handling compared with English willows. The above complaint re the condition in which English osiers are sent away did not apply to the following counties: Berks, Somersetshire, Notts, Lincs, and some growers in the county of Leicester. The finer baskets were made abroad for the simple reason that the people there have had a better technical training in the art of basket making. Where osiers are cultivated in this country and planted on soil suitable for their growth, the quality is of the best. White and red willow wood is not in general demand for basket-making, but the red

willows, where planted on the same lines as osiers, produce a very good quality for basket-making, such as are grown in Belgium in particular. He only bought that quality there, other qualities grown in Belgium being soft and too poor in quality for their basket work. The red willows are cultivated very little in this country, and the bulk of them that are used are imported from Belgium; as also the peeling, or bark, for chemical purposes, which costs, f. o. b. Antwerp, about £4 per ton or less, according to the supply and demand. Mr. Plater also mentioned that he was in Dublin a fortnight ago at a small conference there, by the invitation of the Board of Agriculture for Ireland, on the art of osier growing and the suitability of the basket industry for Ireland.

Mr. Druce (Oxford) said with reference to the fact of the occurrence of salicin in the white willow (*Salix alba*), and its absence from *S. vitellina*, it appeared to him to be in favour of supporting the idea of the specific distinctness of the two plants. He might say that *S. purpurea* and forms of it were extensively cultivated in the Kennet Valley of Berkshire, and there was no reason why manufacturers should have to resort to Belgium or Holland for willow bark for the manufacture of salicin, when the red willow, *S. rubra* of Hudson (a hybrid of *S. viminalis* and *S. purpurea*), which produced an excellent pliant osier, and also contained a large percentage of salicin, might easily be grown in Great Britain, and its culture might easily be of benefit not only to the pharmacist but the agriculturist. Proper care should, of course, be taken in gathering and forwarding the bark to the manufacturer, so that it might compete in quality with that sent from abroad.

Mr. W. B. Cowie (Edinburgh) said he was particularly interested in willow barks from the chemical side of the subject. He had examined a few barks for Mr. Holmes, and the results had been extremely varying. There was a great deal to be gone into, not only in the cultivation of the bark, but also in the keeping of the bark for the preparation of salicin, and, in addition, there was a great deal to be done in regard to better methods for the examination of the bark. That was one thing that the Conference might very well take up. He mentioned this because if various kinds of bark were to be used, and it was found to be desirable to have some spirituous preparations such as the tinctures, a galenical preparation of salicin would be necessary, although it was the sole active principle. He was expecting to receive a few specimens of barks, and if they came to hand he should forward them to Mr. Holmes for investigation.

The thanks of the Conference were accorded to Mr. Holmes and to Mr. Perrédès for their contributions to a knowledge of the willows of commerce.

THE THERMAL WATERS OF BATH.

By W. J. Hallett.

It will, no doubt, be felt that the thermal waters of Bath and their association with the Roman remains are the charm and attraction that induced the Conference Committee to arrange a visit to the "Queen City of the West." Delightfully situated in the valley of the Avon, and covering the graceful slopes of the picturesque hills, the city of Bath holds one of the wonders and sights of the world—the hot mineral springs. Prince and peasant flock to these healing waters in search of health, and as far back as the first century their properties were so highly prized and valued that they were sufficient to induce the valiant Romans to forsake their natural fortresses on the surrounding hills and pitch their camp in the low-lying valley, all contrary to their established strategy, and build around the hot springs a huge military sanatorium.

The mural tablets on the southern side of the bathing establishment give the following information: "These hot springs were used by the Romans as early as the first century. In area, in grandeur, in completeness, the baths of Aquæ Sulis were unequalled"; and a second one reads: "These healing waters have flowed on from time undated to this day, their virtue unimpaired, their volume unabated, their heat undiminished. They explain the origin, account for the progress, and demand the gratitude of the City of Bath."

This meagre information is probably sufficient for the lay mind, but not so to the scientific; and to the chemist, to whom the water—being a medicine—appeals, some knowledge of its composition is desirable. Such information is not readily discoverable in the guide-books, and lack of time will prevent searching for it in the text-books; this is my excuse for trespassing on your time, and what the paper may lack in elegant language I trust will be considered counterbalanced by the facts of interest that it may contain.

Theory of Causation. The actual source and cause of the hot mineral springs is, of course not known, being probably many thousands of feet down in the bowels of the earth, and beyond the

ken of man; but Sir Charles Lyell, the geologist, in addressing the British Association at Bath in 1864, thought that "the Bath springs marked the site of a great convulsion in the crust of the earth, either volcanic or earthquake, and showed that the upper part of the rent through which the hot water rises consists of the strata of Lias and Trias, 300 feet thick." Below this lay the subjacent coal measures, and this is proved by particles of coal being found amongst the sand which the springs bring up. Sir Charles further said that "their great volume and high temperature made the springs unique and without a parallel, taking into consideration the great distance from any region of earthquakes or volcanoes, active or extinct." On the other hand, Dr. Freeman—a local writer—opposes the volcanic theory, and points out that the geological features of the district indicate a tranquil disposition of the materials constituting the several strata, and that the separation between the upper stratum of the high land by the valley is more properly to be ascribed to denudation, at a time, probably, when the valley formed part of a great estuary, the waters of which flowed in the direction of Weston-super-Mare. (Here incidentally it may be mentioned that Beacon Hill, which rises on the north side of the city, topped by a wood, is practically a great stratum of fullers' earth.)

Composition. Many eminent scientists have examined the Bath waters, none of them of more interest to pharmacists than Dr. Attfield. He gives the following analysis (quantities in grains per gallon):—

Calcium carbonate	7·8402
Calcium sulphate	94·1080
Calcium nitrate	0·5623
Magnesium carbonate	0·5611
Magnesium chloride	15·2433
Sodium chloride	15·1555
Sodium sulphate	23·1400
Potassium sulphate	6·7020
Potassium nitrate	1·0540
Iron carbonate	1·2173
Silica	2·7061
Total grains per gallon	168·2898

Prof. Roscoe evaporated some of the water to dryness, and examined the residue by the spectrum—strontium was easily detected. The portion of the deposit soluble in dilute hydrochloric acid was freed from alkaline earths by precipitating with carbonate and

oxalate of ammonium, and in this precipitate strontium was again detected. Magnesium was separated by the ignition of the mixed chlorides with mercurous oxide, and the portion of the residue soluble in water examined, and lithium was plainly visible through the spectrum. Also in both these analyses copper was detected, this being exceptional in mineral waters. It will be noticed from Dr. Attfield's table that the most abundant ingredients are calcium sulphate, magnesium chloride, sodium chloride, and sodium sulphate. The quantity of iron is comparatively minute, but to the taste it is very perceptible, and its medicinal effects on the system quite decided. Iron, lime, and magnesia are plentifully deposited in the channels through which the water is conveyed, and also on the pavements of the public baths. The drinking glasses, after being in use at the Pump Room for some time, become brown and opalescent, the iron deposit appearing to be fluxed to the glass. In addition to the saline constituents, the springs contain and evolve on coming to the surface large quantities of a mixture of gases, which Prof. Williamson elaborately examined in 1865, and gave the following as the volume composition of the gas :—

Carbonic acid	8·056	per cent.
Oxygen	0·617	„
Marsh gas	0·216	„
Nitrogen	96·11	„

Later, Lord Rayleigh found that it also contained argon and helium, 1·2 parts of helium in 1,000 volumes of the gas. This attracted the attention of his great co-worker, Prof. Dewar, who in 1898 experimented with it considerably in his researches on liquid air. He submitted the Bath gas to liquefaction, at the same time comparing it with a liquefied mixture of air and hydrogen, and discovered a marked difference in their behaviour under refrigerating conditions. Whilst the hydrogen and air mixture on condensation gave clear, transparent liquids, the product from the Bath gas was turbid, and a yellowish-brown precipitate was gradually formed, which proved to be a hydrocarbon, probably of the petroleum series, with a marked aromatic smell, and liquid at ordinary temperatures. Another peculiarity of the liquid nitrogen obtained from Bath gas is that on examining it with a spectroscope no trace of oxygen could be obtained, whereas in all other attempts to make nitrogen for liquefaction on a large scale oxygen could always be

detected in the liquid. Prof. Dewar stated that were helium wanted on a large scale, for experimental or commercial purposes, the King's Well at Bath could be made to yield a good supply.

Aquæ Sulis. Is it not a strange coincidence that nearly 2,000 years ago the Romans should have named the springs Aquæ Sulis?—waters of the sun—and to-day one of our greatest chemists pronounces them to be almost the only terrestrial source of helium, that element existing chiefly in the sun. Prof. Dewar has laid down at Bath a plant for collecting the gas from the springs to furnish the Royal Institution with a plentiful supply of nitrogen and helium. Members of the Conference will have an opportunity of seeing this on their visit to the baths.

Physical Characters. Physically the water as drawn from the springs is clear and sparkling; in small quantities colourless, but in large volumes it assumes a pale sea-green tint. It is odourless, and to the taste slightly saline, pungent and chalybeate. Standing exposed to the air it deposits the iron held in solution by the carbonic acid gas. Its specific gravity is 1·002, and temperature is constant at 120° F.

The quality and quantity of the water never varies, and the three springs daily yield 507,600 gallons. An old writer describes them as "perennial springs, whose water is neither increased by the greatest glut of rain, nor lessened by the greatest drought."

As an analogy between the hot springs and a volcano, Sir Charles Lyell remarked that "the apparent want of power of the hot springs to raise voluminous masses of solid matter which volcanoes do, is balanced by the large amount of solid and gaseous matters held in solution and brought to the surface by the springs"; and Prof. Lloyd Morgan (Bristol), in whose university we have the privilege of assembling, has calculated that, the chief spring yielding 385,000 gallons per day, and each gallon containing 150 gr. of solid matter in solution, the daily quantity of matter removed from the earth would amount to 3·68 tons, and in one year would form a column 9 feet square and no less than 223·8 feet in height. Most of you will be visiting the Clifton Suspension Bridge this week, which is 280 feet high; it will give one an idea of the enormous size this column would be, and make us pause and wonder at the work of the agencies of Nature, unseen and unrealized by the mind of man.

The solid constituents in a 12-oz. glass of the water, which is the usual daily dose for those taking the waters, is 13·5 gr., so that it is by no means a homœopathic dose.

Origin of the Constituents and Temperature. In regard to the origin of the mineral and gaseous constituents in the waters, taking Sir Charles Lyell's assumption as correct, that "the water itself is supplied from some mountainous district, possibly a great way off, it may be inferred that the rain-water permeating the earth, it would carry down the calcium sulphate from the gypseous, the calcium carbonate from the calcareous, and the other salts from the decomposing saline rocks.

Gases. The large volume of gases evolved from the Bath waters is very remarkable, no less than 250 cubic feet being given off daily, over 96 per cent. of which is nitrogen. This, Lyell considers, is wholly derived from atmospheric air, carried down by the rain-water, and this being subjected to oxidating processes, the nitrogen is left free. But Bischoff, the eminent German chemist, suggests that it is produced by the action of intense internal heat on stratified organic matter. Nitrogen is more copious in the Bath waters than in any other thermal springs.

The source of the carbonic acid gas, which gives the sparkling appearance to the water, and maintains the iron in solution, is not known, beyond the fact that it is of universal occurrence, it percolates rocks, and decomposes the silicates into carbonates, not only augmenting the volume of the altered rocks, but becoming the source of the carbonates that appear in solution in the springs.

The small quantity of oxygen is no doubt a portion of the atmospheric air carried down by rain and unaltered, and the marsh gas probably arises from the decomposition of carbonaceous deposits.

The Heat or Temperature, which is exceptionally high for thermal springs (120° F.), has been ascribed to the progressive chemical changes that must be continually going on in the structure of the earth, and another writer is of opinion that subterranean heat gives the water its high temperature.

In all probability the real explanation can be found by blending the above two statements. Occasionally there is found floating in the water vegetable matter, being a tiny plant named *Oscillatoria tenuissima,* and sometimes there is deposited small fossilized fruits.

Efficacy. The mineral or gaseous constituents of the Bath springs offer us no explanation of their medicinal virtue, which is chiefly successful in rheumatism and skin complaints. Its curing efficacy is probably due to the union of its various substances and temperature. With the exception of sodium sulphate and lithium chloride, of which there is but the smallest trace, none of the other ingredients are prescribed in everyday medicine for these complaints. That they are of great value in the treatment of disease is testified to by the number of bathers who go under the treatment. During the past ten years no less than 1,020,000 people have attended them, including the highest and noblest in the world of fashion, wealthy trade kings and flourishing merchants, whilst the humbler orders in the social scale pilgrimate there, and through the medium of well-organized hospitals and charities, take off and benefit thereby, the wonderful healing fluid that Nature has endowed the city with.

Formed in Nature's own laboratory, deep down in the bowels of the earth, with a cunning and skill that no artificial mixture is able to rival, it commands the respect and attention of all, and though neither Nature nor the pharmacy laws have been kind enough to appoint the chemists to dispense this natural medicine, a visit to the source of the thermal waters, to see the wonders of the first century bridged to the handiwork of the twentieth will not be wanting in interest, nor will it be an unfitting item of the Conference programme.

Mr. Tyrer referred to the recent literature on the subject of radium and helium, and said the suggestion passing through his mind was that if pharmacists were to be called upon to dispense such substances as helium it would be necessary in the pharmaceutical laboratory to make a more complete study of the spectroscope, as well as of the microscope, and it would be necessary to prepare considerably less doses than the 13·5 grains mentioned by Mr. Hallett as a homœopathic dose.

Mr. Druce hesitated to accept the statement that the waters of Bath were the only source of helium in large quantities. He believed the great thermal springs of Hammam Mesquotine in Northern Africa would be found available for that purpose. In regard to helium emanating from radium he felt inclined to ask: "Has it been actually demonstrated that helium has emanated from radium?" Although extremely probable, from the fact that

the emanations contained an element with an extremely low atomic weight, yet he had not as yet seen that its spectrum had been identified with that of helium.

Mr. BRANSON (Leeds) suggested that in addition to the spectroscope an electroscope would be found useful in dealing with such substances as radium and helium. He strongly recommended pharmacists to follow the advice given recently in the *Pharmaceutical Journal* to study this branch of modern science very closely as it was likely to be of extreme importance in medicine in the future.

Mr. MACEWAN mentioned that Mr. Soddy, who is working with Sir Wm. Ramsay, had contributed a paper to the *British Medical Journal* giving full instructions for the collection of radium-emanations and their use by inhalation. Owing to the cost of radium, it is advisable to use thorium nitrate as a source of the emanations. Thorium emanations are but a millionth of the strength of radium-emanations, but are more suitable for inhalation, as radium is very active. The developments in this subject show that pharmacists can never be too well educated, as here is a substance which, after puzzling the intellects of men like Crookes and changing the conceptions of matter, is handed over to the dispensing chemist for use in medicine.

A vote of thanks was accorded to the author for his paper.

COMPRESSED TABLETS.

A CONTRIBUTION FROM ST. THOMAS'S HOSPITAL LABORATORY.

BY EDMUND WHITE, B.SC. (LOND.), F.I.C.,

AND

HENRY RODWELL, PH.C.

In a paper read by one of us in conjunction with R. A. Robinson before the Conference at Dundee last year (*Pharm. Journ.* [4], **15**, 140), a method for preparing compressed tablets for dispensing purposes was discussed. We found that by the use of an excipient composed of a mixture of starch and oil of theobroma it was possible to produce for dispensing purposes, from almost any prescription, tablets which were presentable and disintegrated with extreme ease when placed in contact with water. This process involved simply a combination of the medicinal sub-

stance or substances in powder with the excipient mentioned above in the proportion of about 4 to 1. It will be observed that no attempt at granulation was made, since the method was only intended to meet the requirements of the dispensing counter. In such cases, one of the many numerous forms of hand-machines would be employed, and the filling of the die would have to be controlled by the operator for each individual tablet. Further experience of this method showed that it was inapplicable for the preparation of tablets on a larger scale, by means of machines with an automatic feed arrangement, except in certain cases where the mixture of substance and excipient happened to form a fairly granular mixture, capable of flowing evenly and uniformly from the hopper to the die.

We have, therefore, turned our attention to the possible modifications of the method which would enable it to be used for manufacturing purposes. The main points which we have kept in view have been (1) the production of an excipient as widely applicable as possible, (2) facilitating granulation, (3) avoiding the use of so-called lubricants. Our object has been, therefore, to find a method which would simplify the published methods by eliminating a great variety of substances of no special utility, and which would yield, by simple combination, a granulated powder ready for compression without further treatment. Another important point is to produce a granulated product containing no fine powder, since this must either be sifted out or leads to trouble in manipulation, by getting between the die and the punch, thus causing the machine to stick and work with difficulty. Even if the fine powder be sifted out, two objections to this procedure immediately arise: (1) it involves another operation, (2) the fine siftings are, in most cases, not homogeneous with the bulk of the product.

Most granular products produced by the use of mucilage, syrup, etc., give tablets which, when crushed, yield a gritty powder. Many substances dispensed in tablet form are advantageously administered, particularly in the case of children, in the form of powder, produced by crushing the tablet immediately before administration. It appeared desirable, therefore, to devise a method by which, when the tablets were crushed between the fingers or between paper, a soft and smooth powder could be produced.

A further requirement was that the granulated material should be capable of being compressed into a smooth polished tablet, with the minimum of compression. This point is not only of import-

ance in relation to tablets which are intended to be crushed to powder—it has also an important bearing upon the disintegration of the tablets, apart from the necessity of adding any substance with a view to aiding disintegration. By the method which we shall presently describe, we find that the use of any such material is unnecessary.

Reviewing the previous paper referred to above, it seemed to us that oil of theobroma, in tablet manufacture, possessed certain advantages which rendered it desirable to make use of the substance on a larger scale. Thus (1) it melts below body temperature, and any coherent mass produced by its agency must necessarily soften when raised to that temperature; (2) it is harmless, digestible, pleasant, and practically tasteless; (3) it acts as a lubricant during compression; (4) it imparts a good surface to the tablet, with the minimum of compression. The problem, therefore, resolved itself into the possibility of devising methods by which the oil of theobroma could be distributed uniformly throughout the material to be compressed, forming at the same time a granulated product capable of automatic feeding, and compression into a coherent polished tablet with the minimum of force.

The solution of this problem has been effected by two methods which we have devised. The first involves the use of the oil of theobroma in the form of an aqueous emulsion, and is applicable to such substances as do not form tough or doughy masses when moistened with water, including the greater number of substances required in tablet form. The second method is to apply the oil of theobroma in ether or ether-alcohol solution, and is applicable to vegetable drugs, such as aloes and other substances, which form masses of a pill-like nature when moistened with water.

Theobroma Emulsion.

The emulsion of oil of theobroma which we have found most useful has the following formula: Oil of theobroma, 25 parts; hard soap, 5; tragacanth, 0·5; benzoic acid, 0·25; water, to 100.

Dissolve the soap in 25 parts of water by heat, add the hot solution to the melted theobroma, and mix by whisking or agitation; shake in the tragacanth, add the benzoic acid, then the remainder of the water. Gum acacia may be used in place of soap without making any appreciable difference in the general utility of the product. The product in either case should be a thick, smooth, white cream, free from lumps. The addition of benzoic

acid is only necessary as an antiseptic precaution if the product be kept in stock.

The method of application is as follows: The substance to be compressed, in the finest possible powder, should be triturated with sufficient of the emulsion to form a damp coherent powder—so damp that it can be shaken through a No. 20 or 30 sieve without pressure, and without adhering to the meshes; the sifted product, after exposure to the air for a few hours, or during the night, is ready for compression. If the drying process be accelerated by the application of heat, the dried product must be allowed to cool for an hour or two at least for the theobroma to solidify, before compression is attempted, but in the majority of cases it is better to avoid the use of artificial heat. If the bulk of substance to be compressed in each tablet either demands or allows the addition of any diluting material, we have found cane sugar to be the best; in no case does it interfere with the production of a good tablet, and in some cases the addition appears to be quite necessary. When the substance to be compressed is of a dusty nature, and has little inherent tendency to cohere on compression, the addition of a little glucose, as shown in some of the formulæ given below, is advantageous, giving a tablet with better finish, and less liability to crack after compression.

Ether-Alcohol Solution of Theobroma.

The formula for the ether-alcohol solution is as follows: Oil of theobroma, 1 fl. oz.; ether, to 6 fl. oz. Dissolve and add an equal volume of rectified spirit, as required for use.

The manner of granulating with the above is to add it to the substance or mixture contained in a mortar, trituration being accomplished as quickly as possible, and the whole of the solution required being added at once. The mass is then passed through a No. 20 or 30 sieve, and allowed to dry by exposure. Compression can, in some cases, be proceeded with almost immediately, but it will be found more satisfactory generally to allow the mixture to stand for an hour or two. Sugar granulates remarkably well with the above excipient, and the previous remarks on its addition apply here as well.

Special Formulæ.

In addition to experimenting with the substances commonly employed in tablet form, we have tried a number of formulæ for official and unofficial pills. With the exception of certain very

expensive forms of pill machinery, it appeared to us that the machinery such as is available for pill making involves a large number of operations, and that the results are usually more or less unsatisfactory. The most objectionable features in the results obtained by massing, piping, and cutting the pill-mass we consider to be (1) the use of heat, particularly in drying the pills, and (2) the large proportion of cut pills which have to be rejected on account of imperfections either in weight or form. This necessitates the return of the rejected material to be subjected afresh to manipulation, thus involving a waste of time and labour, and exposing the material once more to the risk of damage. If the same materials could be produced in tablet form they would be subjected to no risk of damaging their medicinal properties, the whole quantity could be worked off to the last few grains, and no residue would remain for re-manipulation. Among the formulæ now given will be found several typical of the pills in common use, and the results have been so satisfactory that we are extending our experiments, as opportunities allow, to all the pills required for hospital use. Doubtless a few formulæ will prove intractable, owing to the fluid nature of certain ingredients, but for the majority of cases we have little doubt that the change from pill to compressed tablet can be made with advantage. Any argument as to the relative advantage offered by the spherical or flattened shape respectively of the two forms can be dismissed as trivial, the main point to be kept in view being the selection of the method which most simplifies the manipulative operations, and allows of accurate dosage with the least possible damage to the medicinal properties of the constituent materials. The following formulæ have been selected to illustrate the application of the excipients whose formulæ are given above:—

Tablets made with Theobroma Emulsion.

1. *Soda-mint.* Sodium bicarbonate, 40 parts; oil of peppermint, 1; theobroma emulsion, 8.

2. *Grey Powder.* Mercury with chalk, 3 parts; sugar, in powder, $2\frac{7}{8}$; theobroma emulsion, $\frac{3}{8}$.

The dried product weighs 6 parts. It is used chiefly for producing 1 and 2-grain tablets with very light compression, so that they may easily be crushed to powder for administration to children. With light compression it is difficult to ensure a polished surface, and we are still experimenting with a view to the improvement of this formula.

3. *Hutchinson's Pills.* Mercury with chalk, 3 parts; compound powder of ipecacuanha, 3; theobroma emulsion, 1.

When dried, tablets weighing 2·1 grains will contain 1 grain each of the two chief constituents. If granulated with mucilage or syrup a very considerable proportion of fine powder is produced during the sifting.

4. *Bismuth and Soda.* Bismuth carbonate, 3 parts; sodium bicarbonate, 2; theobroma emulsion, 1.

When dried, tablets weighing 5⅓ grains will contain 3 grains of bismuth carbonate.

5. *Thyroid Powder.* Dried thyroid gland, 11 parts; sugar, in powder, 10; theobroma emulsion, 3.

When dried, tablets will contain half their weight of dried thyroid. They should not be compressed too firmly, or the tablets have a tendency to crack.

6. *Saccharin.* Saccharin, 9 parts; sodium bicarbonate, 8; theobroma emulsion, 3.

The dried granules contain half their weight of saccharin, and disintegrate readily, particularly in warm fluids. The addition of a trace of starch might be considered advantageous by some, but it does not appear to be necessary.

7. *Santonin and Calomel.* Santonin, calomel, cocoa, sugar, of each, equal parts; theobroma emulsion, q.s.

This is made into 4-grain tablets, lightly compressed, so as to be easily crushed, for administration in powder form to children.

8. *Compound Calomel Pill.* Calomel, 1 part; sulphurated antimony, 1; guaiacum resin, 2; sugar, 1; theobroma emulsion, 0·5.

This is practically the compound pill of calomel of the British Pharmacopœia. Since it contains a large proportion of resin, and forms a pill mass with ether-alcohol, the aqueous emulsion forms the most useful excipient.

9. *Phenacetin.* Phenacetin, 17·5 parts; sugar, 7·0; glucose, 0·5; theobroma emulsion, 2·0.

The glucose should be first added to the emulsion. This formula yields a coherent tablet with light pressure. Without glucose more pressure is necessary to avoid adhesion to the die. Possibly the proportion of cane sugar might be reduced.

10. *Phenazone.* Phenazone, 5 parts; sugar, 1; glucose, 0·075; theobroma emulsion, q.s.

11. *Quinine Sulphate.* Quinine sulphate, 5 parts; sugar, 2·5 glucose, 0·25; theobroma emulsion, 1.

12. *Acetanilide Compound.* Acetanilide, 2 parts; caffeine citrate, 1; sodium bicarbonate, 1; glucose, 0·125; theobroma emulsion, 0·75.

This formula represents the tabellæ acetanilidi comp. of the 'St. Thomas's Hospital Pharmacopœia.'

13. *Iron Tablets.* We have experimented with various formulæ to replace the official Pilula Ferri, but have not yet succeeded in obtaining a good tablet *containing* ferrous carbonate, owing to the oxidation which this substance suffers during the preparation of the materials for compression. If, however, crystallized ferrous sulphate and sodium bicarbonate be separately granulated with theobroma emulsion and the dried granules be mixed in the required proportions, the mixture may be compressed to a satisfactory tablet which disintegrates and forms ferrous carbonate very readily when moistened. As the formula is still under trial we refrain here from giving details, since these are not yet settled entirely to our satisfaction.

Tablets made with Ether-Alcohol Theobroma.

14. *Opium.* Opium in fine powder, 2 parts; sugar, 1; ether-alcohol theobroma, 0·75.

15. *Pepsin.* Pepsin, 2 parts; sugar, 2; ether-alcohol theobroma, 1.

16. *Cascara Extract.* Cascara extract in powder, 2 parts; sugar, 1; ether-alcohol theobroma, q.s.

17. *Compound Rhubarb.* Rhubarb, 3 parts; socotrine aloes, 2·25; myrrh, 1·5; oil of peppermint, 0·175; sugar, 4; ether-alcohol theobroma, 1·5.

The above is practically the official formula for compound rhubarb pill, in which the syrup and soap are replaced by sugar and theobroma.

18. *Podophyllin Compound.* Podophyllum resin, 1 part; calomel, 4; alcoholic extract of belladonna, 0·66; sugar, 4; ether-alcohol theobroma, 1·5.

Made into 2½-grain tablets, each containing 1 grain of calomel.

19. *Aloin Compound.* Aloin, 8 parts; ipecacuanha, 2; extract of nux vomica, 1; sugar, 4; ether-alcohol theobroma, 6.

20. *Aloes and Iron.* Barbadoes aloes, 2 parts; exsicc. ferrous sulphate, 1; comp. cinnamon powder, 3; sugar, 3; ether-alcohol theobroma, 1·25.

The above represents the official pill of aloes of iron.

Compressed Lozenges.

We have also tried the preparation of various lozenges by compression instead of the usual method of manufacture, and have obtained results which appear very satisfactory. The advantage of avoiding the application of heat is obvious in the case of volatile substances, such as phenol and essential oils. The general method followed was to granulate the mixture of medicament, sugar, and gum, by means of the theobroma emulsion, and highly compress the dried granules. So far as the Pharmacopœia lozenges are concerned we have succeeded with each of the official bases, and submit samples made with simple, rose, tolu, and fruit bases respectively.

General Remarks and Summary.

It will be seen that, excluding the cases of substances like potassium chlorate, which may be compressed without any addition of excipient, the results of our work may be thus summarized: Oil of theobroma, applied as directed, may be used as a granulating and lubricating agent in two ways; (1) as an aqueous emulsion, and (2) as an ether-alcohol solution. With regard to the proportions given in the formulæ above, some variation may be found according to the details adopted in mixing. The addition of small quantities of glucose was found to exert a beneficial influence in certain cases where the material had a tendency to stick to the dies or crack after compression, and appeared to indicate that the granules in such cases possessed insufficient cohesive power. As a rule, formulæ containing much sugar require relatively little emulsion as excipient. With crystalline salts addition of sugar is usually unnecessary. The selection of one or other of the two forms of excipient is controlled by the nature of the substance to be granulated, that one being avoided which forms a lumpy or tough mixture of a pill-mass nature. Ethereal solution, without alcohol, was found to be of limited use owing to its inability to give satisfactory granules. Further experience will probably show that the relative proportions of ether and alcohol may be varied with advantage in certain cases.

Mr. Naylor said one of the drawbacks of the suggestion made by Mr. White last year in regard to the use of theobroma and starch was that a very large proportion of excipient was required. That was an objection to the retail pharmacist, if not to a large

hospital. There was another direction in which an improvement might be suggested, and that was that the tablet consisting of some insoluble material such as sulphonal should be made to disintegrate readily when put into water. Mr. White had stated that when the tablet was put into the stomach disintegration took place; but such a result did not take place in cold water. There were a number of tablets on the market which would crumble when put into cold water, and he thought it was advisable that when insoluble powders were made into tablets they should disintegrate quickly. He was very glad that Mr. White had gone into the subject of compressed tablets, because, with one exception, previous work that had been published in the pharmaceutical journals on the subject was unsatisfactory. The exception was a paper read before the Conference a few years ago by Mr. Hardwick, of Bournemouth. A great many of the published excipients he had tried, both in hand machines and on a large scale, had made tablets so hard and so compact, the matter cohering so firmly that it was possible for the tablets to remain in water for two or three days without showing any sign of solubility, even in the case of such a soluble substance as antipyrine. He thought it was high time that pharmacists who wish to make their own tablets had placed before them some practical method of preparing them, and he thought they were extremely fortunate in having the matter dealt with so ably as Mr. White had done.

Mr. G. F. Merson (Newcastle), referring to the paper read by Mr. White at the Dundee meeting last year, said he had found that with the formula then suggested by Mr. White, when a dark substance was used it was impossible to prevent the white colour of the excipient from showing and giving the tablets a speckled appearance, and he wished to ask if the theobroma emulsion was open to the same objection.

Mr. F. H. Alcock said he was very much pleased to hear Mr. White's remarks upon pills and the general principles involved in making them. From the statements made in the paper in regard to iron tablets it would seem that Mr. White had not been able to get a successful pil. ferri tablet. He was inclined to think that the presence of soap in the theobroma emulsion would interfere with that. Then again, in the santonin and calomel preparation, the soap being alkaline would affect the calomel.

Mr. E. W. Pollard (Ryde), speaking as a former assistant to Mr. Hardwick, said they had never experienced the difficulty mentioned by Mr. Naylor in regard to the insolubility of tablets

made at the dispensing counter, and he questioned whether tablets made from Mr. White's formula would remain in water for two or three days without disintegrating.

Mr. White, in reply, said he did not understand Mr. Naylor to say that the tablets made from his formula would not disintegrate, therefore the remarks made by Mr. Pollard would not require any reply. In regard to the very insoluble tablets mentioned by Mr Naylor, he could only suggest that more starch should be added. With reference to Mr. Merson's question, he personally did not object to speckled tablets—rather the reverse. If a person made a solution of ammonia and it turned out "cloudy," he did not filter it, but boasted about its being cloudy, and in the same way the pharmacist might boom his speckled tablets. The formula published in the paper last year was devised to meet the requirements of the dispensing counter. In regard to Mr. Alcock's remarks, he did not say that he could not make an iron-pill tablet, but he would not put forward a formula until he could say that it would be satisfactory. He thought the difficulty in regard to the soap might be got over by alternatively using acacia in place of soap in the emulsion, as suggested in the formula.

The meeting then adjourned till Wednesday, and the members of the Conference left Bristol by the 5 p.m. train for Bath, where the various places of interest were visited.

LIQUOR RHEI CONCENTRATUS, B.P.

By F. C. J. Bird.

This liquor is prepared from rhubarb root, in No. 5 powder, by percolation with 20 per cent. alcohol, according to the special method adopted in the Pharmacopœia for the greater number of the concentrated liquors. It cannot be considered to be quite a satisfactory preparation, for on keeping it almost invariably throws down a brownish yellow deposit, which often adheres to the sides of the bottle containing it. After a considerable time, however, deposition ceases, and the liquor becomes permanently bright.

The official process for the extraction of the root is, in the case of liquor rhei conc., but moderately successful. The following results were obtained with a small experimental quantity, prepared by the official process, very carefully carried out;—

Finished Liquor.	Extractive.	Per cent. of Total Available Extractive.
20 fl. oz.	18·1	59·6
Subsequent percolate.		
1st, 10 fl. oz.	7·4	16·8
2nd, 10 fl. oz.	4·4	10·0
3rd, 10 fl. oz.	3·7	8·7
4th, 10 fl. oz.	1·9	4·2
5th, 10 fl. oz.	0·3	0·6
6th, 10 fl. oz.	0·	0·1
		100·0

From this it is evident that only about 60 per cent. of the available extractive of the root is contained in the B.P. liquor rhei conc.

A second sample of liquor rhei conc. was prepared from drug containing 8·7 per cent. of moisture (which moisture was allowed for by using a calculated excess of alcohol in the first maceration), and the product submitted to various tests. It was found that, although perfectly brilliant when first prepared, deposition took place on keeping, particularly when the temperature was variable. Weak acid also, on standing, caused a more or less marked turbidity and precipitation, indicating the importance of guarding against loss of alcohol during percolation and storage. From the effect of change of temperature it seemed evident that liquor rhei conc. was a fully saturated solution of the constituents of rhubarb, particularly the resinous ones, and that at a lower temperature this state of saturation could not be maintained, and precipitation took place.

A similar procedure to that recommended for liquor krameriæ conc. in a previous paper—namely, the incorporation with the finished product of a certain amount of a more powerful solvent of the precipitable constituents—appeared likely to improve the formula, and on trial this was found to be so. Of the solvents tried glycerin was the best, but it required to be present to the extent of 15 per cent. to be effective under all conditions. A sample of liquor prepared by the B.P. process, modified as in the formulæ given below, has kept for some months quite free from deposit, and will bear exposure to a temperature just above

freezing point without precipitation. The B.P. liquor, when cooled to the same degree, becomes turbid, opaque, and finally thick, and even gelatinous. It is, therefore, suggested, for the production of a permanent liquor rhei conc., that the B.P. formula be extended as follows:—

Concentrated Solution of Rhubarb.

. . . continue percolation with more alcohol, and reserve the first 17 fl. oz., then percolate an additional quantity of 3 fl. oz., remove the alcohol from the latter, and evaporate the residue to a soft extract, dissolving it in glycerin 3 fl. oz.; add to the reserved percolate to produce a final volume of about 20 fl. oz.

When diluted with water, liquor rhei conc., prepared as above, forms a clearer solution than the B.P. preparation, and possesses a slightly sweet taste, due to the glycerin, which is not objectionable.

LIQUOR SENNÆ CONCENTRATUS, B.P.

By F. C. J. Bird.

This liquor is one of the most unsatisfactory of the B.P. liquors, on account of its bad keeping qualities and the deposition, with loss of extractive, which takes place on storing it for any length of time. The method of preparation ordered in the B.P. consists in extracting senna leaves, in No. 5 powder, with distilled water by re-percolation. The strong aqueous percolate is then heated to 180° F. for five minutes, and when cold mixed with a certain proportion of alcohol and tincture of ginger to precipitate mucilaginous substances and confer flavour and pungency. After standing for seven days the whole is to be filtered, when the product obtained from the B.P. quantities should, according to the Pharmacopœia, measure 1 pint.

The weak points of the process are that the senna leaves are macerated with distilled water for a period of time, which must, by strictly following the official directions, extend to at least seventy-two hours, and probably much more. With a liquid so prone to decomposition, especially in hot weather, as infusion of senna, this procedure results in fermentation and acidity, and is very likely to interfere with the keeping properties of the final product. Then when the aqueous percolate has reached a volume

of 16 fl. oz., it is heated to 180° F. for five minutes. Naturally loss will take place here, varying in amount according to the way in which the operation is carried out, and no allowance is made for this in the formula. In one experiment the percolate, after being heated, measured when cold but 15 fl. oz., so that with an increased relative proportion of spirit the precipitation of mucilaginous substances would be greater and the final volume correspondingly less. There would also be some loss in filtering, so that in that instance the final product could not possibly measure 1 pint.

The process of extraction adopted for senna is perhaps less efficient than in the case of any of the other liquors, the first percolate containing between 55 and 56 per cent. only of the available extractive of the leaves.

1st Percolate.	Sp. Gr.	Extractive Grammes per 100 c.c.	Per Cent. of Total Available Extractive.
16 fl. oz.	1·119	24·3	55·7
Subsequent percolate—			
1st, 5 fl. oz.	1·085	18·0	12·9
2nd, 5 fl. oz.	1·053	11·5	8·3
3rd, 5 fl. oz.	1·039	8·2	5·9
4th, 5 fl. oz.	1·028	6·5	4·7
5th, 5 fl. oz.	1·023	4·5	3·5
6th, 5 fl. oz.	1·016	3·3	2·6
7th, 5 fl. oz.	1·013	2·7	1·9
8th, 5 fl. oz.	1·011	2·0	1·4
9th, 5 fl. oz.	1·007	1·5	1·0
10th, 5 fl. oz.	1·006	1·2	0·8
11th, 5 fl. oz.	1·005	1·1	0·7
12th, 5 fl. oz.	1·004	1·0	0·6

The activity of the various percolates, as far as could be judged by the taste, corresponded with the extractive content. Liquor sennæ conc. made by the B.P. process often filters sluggishly, and the clear liquid on keeping continues to deposit and lose extractive. In the experience of some it has also been found to ferment and keep badly. Although the proportion of alcohol in the formula is fairly high, it does not appear sufficient to promptly cause a satisfactory precipitation of the aqueous liquid previous to filtration; but it is hardly desirable in such a preparation to increase the alcohol to any great extent. After standing from seven to fourteen days the liquor can be filtered

quite bright, but if the clear filtrate be afterwards kept it will become cloudy and again deposit. If also it be heated in a water bath, as soon as a temperature of about 120° F. is reached turbidity occurs and the liquor finally becomes quite opaque. If the heating be continued for a time a fine precipitate forms, aggregates, and settles, so that the supernatant fluid remains perfectly clear. On filtering and again heating no further precipitation can be induced.

The following figures were obtained from a sample of bright liquor sennæ conc. before and after heating: Liquor sennæ conc. B.P., filtered bright, sp. gr., 1·051; extractive, 17·2. After heating in a closed vessel for half an hour to 180° F., and filtering when cold, sp. gr., 1·045; extractive, 16·3.

It would therefore appear that a more uniform and satisfactory liquor sennæ conc. can be prepared by the following modification of the B.P. process:—

1. Substitute chloroform water for distilled water in the extraction of the senna.

2. Make up the volume of the aqueous percolate, after having been heated to 180° F. for five minutes and cooled, to 16 fl. oz. with distilled water. All odour of chloroform disappears here.

3. Increase the alcohol in the formula from 2 fl. oz. to 2¼ fl. oz. to compensate for the making up of the volume of the percolate.

4. When the filtered product has stood for seven days, before filtering heat the whole to 180° F. in a closed vessel for half an hour or longer, until the precipitate aggregates and the supernatant liquor becomes quite clear, then cool and filter.

After heating as above the liquor filters quite readily, and the product is brilliant and keeps for months without change. When diluted with water, 1 to 9, the infusion from the modified formula keeps sweet considerably longer than that from the B.P. liquor. It is also slightly darker in colour, but otherwise in taste and appearance there is little perceptible difference.

Mr. E. F. Harrison (London) inquired if Mr. Bird had made any experiments to produce a liquor containing much more than 60 per cent. of the extractive, which must be considered far from

satisfactory. Had the concentration and addition of the later portions of percolate been tried? He also asked whether, in Mr. Bird's experience, there was much demand for these preparations.

Dr. SYMES thanked Mr. Bird for his very careful notes. Some years ago glycerin was largely used as a preservative agent, but, except where used in a somewhat large proportion of the finished preparation, it failed in that respect. It was, however, a valuable agent as a solvent and for retaining resinous matters in solution; it no doubt acted in that way in Mr. Bird's formula for liq. rhei. He thought it might probably exercise those properties more completely if it were added to the menstruum before, instead of after, percolation. He would like to ask if Mr. Bird had experimented in that direction.

Mr. NAYLOR said there could be no doubt that the suggestions of Mr. Bird were extremely valuable—suggestions which were greatly needed in the compilation of the future B.P., as the present official preparation was a very unsatisfactory one. He thought it was well known that those engaged in the wholesale trade had been accustomed to Pasteurizing their senna preparations, and he did not think that by subjecting the liquor to the degree of heat for the period of time indicated by Mr. Bird the preparation was in any way deteriorated or rendered less efficient medicinally. It would, perhaps, be well to ascertain what the precipitate was that settled down and was subsequently removed.

Mr. BASCOMBE said Mr. Bird had not brought forward any standard for extractive. When the present B.P. was published he (Mr. Bascombe) made a number of experiments with liq. rhei conc. and liq. sennæ conc., and he found that after three years the average depreciation in extractive in the liq. rhei conc. was 1 per cent. per annum, and the average for the senna was rather less. He thought the addition of glycerin to the menstruum would be advantageous, but he suggested that instead of the addition of glycerin to the menstruum it be added to the weak percolate and evaporated in that form.

Mr. H. WIPPELL GADD agreed that these preparations required to be improved; in fact, he might venture to say that the best improvement would be to improve them off the face of the earth. In his experience, there was very little demand for the preparations ten times the strength of the infusions. It was an awkward strength, and no one seemed to like it or to want it.

Mr. BIRD, replying to Mr. Harrison, said his chief object was to improve the present formula by simple modifications rather than

propose entirely new ones. He thought that the formula was by no means perfect, and very much better extraction could be ensured on the lines mentioned by Mr. Harrison; but that, of course, was a matter for further experiment. Dr. Symes had spoken of the use of glycerin as a preservative. He (Mr. Bird) had not used it in that capacity, but rather as a powerful solvent of the precipitable constituents of rhubarb. There was little risk of injuring by evaporation in the modified formula, as it was the weakest portion of the percolate which was evaporated to a soft extract. He did not add glycerin to the menstruum, as that appeared likely to furnish a preparation as troublesome as the present one. His object was to have an excess of solvent in the finished product. Mr. Naylor had mentioned the trouble caused by the bad-keeping qualities of these preparations. That had, he thought, been experienced by every one more or less. He was glad to know that Mr. Naylor did not think exposure to a moderate evaporation injured the senna preparation. Although injury was not improbable, it was a point he had not had the opportunity of determining. The use of glycerin had an objection when the question of standards arose. The first results published by Mr. Bascombe soon after the appearance of the B.P. showed a certain loss in liq. sennæ after keeping one year. That was very similar to what occurred when the liquor was heated. These preparations were used very extensively in some parts of the United Kingdom, whilst in others they were almost unknown. He could hardly agree with Mr. Gadd in wishing for the disappearance of the liquors from the Pharmacopœia. He thought that with the processes somewhat modified they would very well represent the respective drugs, and that they form a useful series of preparations. As to their strength the B.P. liquors could, as he had before pointed out, be easily converted whenever necessary into the weaker 1 to 7 preparations by dilution with the requisite proportion of menstruum.

A vote of thanks was accorded to Mr. Bird for his papers.

CHEMICAL EXAMINATION OF KÔ-SAM-SEEDS

(*Brucea sumatrana*, Roxb.).

By Frederick B. Power, Ph.D.,

and

Frederic H. Lees.

The name Kô-sam, by which the seeds under investigation are known, appears to be of Chinese origin, although in the medical literature of China and Cochin China it is sometimes written Khô-sam. In the language of the latter country Khô-sam is stated to signify gentian. The botanical name of the plant producing the seeds is *Brucea sumatrana*, Roxb., a shrub growing about two metres in height, belonging to the natural order of Simarubaceæ. An excellent botanical description of the genus *Brucea*, with illustrations of the flowers and fruits of the two more important species, *B. antidysenterica* and *B. sumatrana*, is given by Engler in *Die natürlichen Pflanzen familien*, theil iii. abtheil. 4, p. 220. Leipzig, 1896. In this work the following five species of *Brucea* are recorded with indications of their respective habitats and uses: (*a*) *B. antidysenterica*, Lam., Abyssinia; *B. paniculata*, Lam., Tropical West Africa and Upper Guinea; *B. tenuifolia*, Engl., Usambara; *B. mollis*, Wall., Khasia. (*b*) *B. sumatrana*, Roxb., from Farther India through the Indian Archipelago and Cochin China to Australia and the Philippines. "All the species are very bitter. The bark and the fruits of *B. antidysenterica* are used with success in Abyssinia for diarrhœa and fever. All the parts of *B. sumatrana* are esteemed in the East Indies as a stomachic tonic, and are also used for diarrhœa, intermittent fever, and worms."

A species of the botanically closely allied genus *Picrasma* is referred to in the *Pharmacographia Indica*, vol. i. p. 287, as follows: "*Picrasma quassioides*, Benn., is a small tree or large bush indigenous to the sub-tropical Himalaya and South China. It is recognized by the Indian Pharmacopœia under the name of *Brucea* (*Nima*) *quassioides*, and the bark, which is very bitter, has been recommended as a febrifuge." The wood of this plant has been assumed to contain quassin, but no complete chemical examination has as yet been made of it.

During the past few years Kô-sam seeds have been brought somewhat prominently to notice, on account of their reputed value

as a remedy in dysentery. Dybowski, in some papers published in the *Revue des Cultures Coloniales*, Paris (tome vi., January 5 and April 5, 1900), has particularly called attention to these seeds, and quotes Dr. Mougeot, of Saigon, as having discovered that five or six of the kernels, taken in the morning, crushed with crumb of bread, are a sovereign remedy for the most pernicious dysenteries of tropical countries. Dr. Mougeot has reported that out of 879 cases treated by him, 799 were completely cured in from three to six days, while 57 of these cases required 15 days. The popular interest in this remedy is shown by the following notice, which appeared in a recent issue of the *Rangoon Gazette*: "The ravages which dysentery caused among Europeans in the Tropics before the disease was as well understood as at present were terrible; and now, although it is affirmed by many medical men that dysentery, if taken in time, is practically always amenable to treatment, and but seldom fatal even when for a short time neglected, yet the number of deaths caused by it, especially among children, is still very great. It is most certainly good news to hear that a new cure for it has been discovered in the seeds of the *Brucca sumatrana*, which are said to be as much a specific for it as quinine is for malaria."

The most extended notices that have thus far appeared relating to the botanical and chemical characters of Kô-sam seeds are contained in a series of papers published in the previously mentioned *Revue des Cultures Coloniales*, Paris, 1900, Nos. 47, 48, and 50, short abstracts of which have been given in the *Pharm. Journ.*, 1900, **64**, 463, 687. The authors of the present paper have, nevertheless, deemed it desirable to consult the original publications in order to ascertain the evidence upon which the statements relating to the chemical constituents of the seeds are based. As the publications referred to are, to a considerable extent, of a controversial nature, the following references to them are restricted to such details as have a direct bearing upon the results of our investigation, or which have seemed necessary for the more satisfactory elucidation of the subject.

Professors Heckel and Schlagdenhauffen (loc. cit. **47**, 97–104) appear to have been the first to make a chemical examination of Kô-sam seeds. They state that from the close botanical relationship of *Brucea* with *Quassia amara* and *Quassia simaruba* they were at the beginning led to conclude that the active principle of the seeds would prove to be quassin—the bitterness being of the same nature—and that their chemical

analysis had confirmed this supposition. The results of their investigation were given in the following order:—

1. By extraction with carbon disulphide they obtained 57·14 per cent. of a fatty oil, having a yellow colour, a slightly bitter taste—attributed to a trace of quassin—and a density of 0·912.

2. By subsequent abstraction with chloroform 0·483 per cent. of solid matter was obtained. On treating this with water a bitter principle was dissolved, leaving an insoluble substance of a resinous nature. The bitter principle is stated to have the characters of quassin, a conclusion which seems to depend upon their observation that when the aqueous solution was evaporated on a watch-glass to dryness with a drop of dilute hydrochloric acid, needle-shaped crystals were obtained, as in the case of quassin when tested under the same conditions. It was furthermore noted that by the action of concentrated sulphuric acid on these crystals and on pure quassin, identical results were obtained. As they subsequently remark that quassin suffers no change of colour in contact with concentrated sulphuric acid, the evidence of identity was of a purely negative character.

3. By subsequent extraction with alcohol 6·972 per cent. of solid matter was obtained. On treating this with water it was resolved into a soluble and an insoluble portion. The latter was partly composed of proteid matter, while the soluble portion also contained some nitrogenous principles of the same class, together with a certain quantity of glucose and saccharose. In the 6·972 parts of total residue they found 3·199 parts of albuminoid matter the remainder being stated to consist of sugar and quassin, associated with another bitter principle and saponin. They separated these principles by treating the powdered alcoholic extract with amyl alcohol. It is stated that on evaporating the latter liquid, and taking up the residue with water, the quassin is first dissolved, and, some time afterwards, the second bitter principle. The first solution, which was very bitter, they evaporated to dryness, and then treated the residue with chlorine water by evaporating to dryness with the latter on a water-bath. No change of colour was observed under these conditions or when treated with concentrated sulphuric acid, and these negative characters were considered to appertain to quassin. Furthermore, as the residue was very bitter, and, under the previously mentioned conditions, formed needle-shaped crystals, they state that one may conclude, without fear of contradiction, that quassin is present. As to the other bitter principle, less readily soluble

in water than quassin, it is said to have the property of becoming coloured blue when evaporated on a water-bath in the presence of a little chlorine water, and to be coloured violet by concentrated sulphuric acid. These reactions were compared with those afforded by saponin, and, although not agreeing completely, the presence of the latter was considered probable on account of the frothing of the liquid when shaken with water. Notwithstanding the above affirmations, it is remarked that, as the quantity of material operated upon was small, they give these results only as indications, and propose to repeat the experiments with one or two kilos of the seed. The amount of material actually used is nowhere stated.

4 On finally extracting the seeds with water they obtained from the aqueous liquid a residue of gummy matter amounting to 20·5 per cent. The material left after extraction with the above solvents was found to contain an amount of insoluble albuminoid matter corresponding to 5·937 per cent. in the original seeds.

It will be seen from the results of the experiments of Heckel and Schlagdenhauffen, as above outlined, that they did not isolate any definite active principle from Kô-sam seeds, or even obtain it in such a state of purity as to permit of its satisfactory identification. In fact, they have not recorded in their paper a single analysis of an individual substance. It is, therefore, somewhat surprising that they should repeatedly and so positively affirm that the seeds in question contain quassin, as may be seen from the following sentences, which are literally quoted :—

"Comme on a pu le constater par l'analyse précédente, la graine de Kô-sam renferme comme principe dominant la quassine, ainsi qu'il était permis de la prévoir."

"En somme, le Kô-sam doit son action à la quassine, et il y a bel âge que l'emploi de ce principe actif est populaire en Europe par l'usage quotidien que l'on en fait dans le *Quassia amara*, si bien que le nouveau remède contre la dysenterie de M. Dybowski n'a rien de nouveau, les Abyssins l'employant de temps sans doute immémorial."

"Cette étude aura pour résultat de mettre les faits relatifs à ce pretendu nouveau medicament à leur veritable point scientifique, et, dès lors, les médecins coloniaux pourront poursuivre leurs expériences sur le Kô-sam en toute connaissance de cause."

The conclusions of Heckel and Schlagdenhauffen have elicited some comments from Dybowski (loc. cit. **48**, 129–31), but, unfortunately, these are not altogether consistent, and, there-

fore, only tend to produce further confusion. Dybowski remarks that Schlagdenhauffen has made of Kô-sam a very complete analysis and a conscientious study, but that the conclusions Heckel draws therefrom are totally wanting in scientific precision. In the chemical portion of their paper they are said to err in two respects, which he will indicate. It appears to him, and an examination made by Bertrand likewise leads him to presume, that the fruits of *Brucea sumatrana* contain quassin. But to be able to make such an affirmation, and not give an *à priori* conclusion, it would have been better, in his opinion, to precisely characterize this substance by an elementary analysis, and by determining its crystalline form, melting point, solubility, etc. None of these data have been recorded, and the negative characters together with the bitterness of the substance, to which Heckel appears to attach so much importance, and upon which he bases his conclusion, are considered inadequate and not to permit of any scientific deduction. Dybowski thinks that Schlagdenhauffen has overlooked the most interesting point in the study of Kô-sam, and that as he has mentioned the occurrence of "another bitter principle" he should have searched for this, the rest being of little importance. He then proceeds to state that Bertrand has isolated a glucoside having extremely active properties, and that it is the discovery of this substance, not the presence of quassin, which entitles Kô-sam to be regarded as a new remedy for dysentery.

A still later publication (loc. cit. **50**, 196–201) embraces a conjoint study of Kô-sam, in which the botanical characters are considered by Dybowski, the chemical composition by Bertrand and the physiological action by Phisalix. Although Bertrand, in his very brief communication, has indicated that he only gives the results of a preliminary investigation, his conclusion as to the glucosidal nature of the assumed active principle is not supported by any satisfactory experimental evidence of its correctness. After noting that the seeds contain 19·5 per cent. of fatty oil, he states that it is in the substances extracted by alcohol that one finds the active principle—kosamine, as he proposes to call it. This is said to possess extraordinary bitterness, and to be related to the glucosides, since it afforded a reducing sugar, probably glucose, when boiled with dilute acids, but the products of its hydrolysis were not determined.

Kosamine is described as being practically insoluble in most of the anhydrous solvents, such as petroleum ether, carbon disulphide, chloroform, etc., but to dissolve readily in water and in

aqueous alcohol. It is not precipitated by either neutral or basic lead acetate, and it was by means of these properties that he was able to separate it from the various other substances accompanying it in the seeds, such as oil, resin, acids, etc. The subsequent remark, however, is somewhat significant, that he does not insist at present upon the chemical properties of kosamine, hoping to return to the subject when a sufficient quantity of the fruits shall have been obtained to enable him to complete the study. He also notes that he considered it more useful to determine the physiological properties of this active principle than to satisfy his curiosity as a chemist by reactions which are always destructive. Inasmuch as Kô-sam seeds have been observed by us to contain a considerable amount of a reducing sugar, it would be of some interest to learn how the so-called kosamine had been separated in a state of sufficient purity to even permit of its identification as a glucoside. No description, however, of this substance is given which would indicate that it was obtained in any other form than in solution, and it is recorded by Phisalix that he received it from Bertrand in this form for his physiological experiments.

The uncertainty respecting the individuality of the substance designated as kosamine naturally detracts from the importance and interest which the result of the study of its physiological action would otherwise possess, and it, therefore, does not seem necessary that the properties attributed to it should be considered here.

With this survey of the subject we proceed to give the results of our own investigation.

Experimental.

The material for this investigation was obtained through the kindness of Mr. H. N. Ridley, Director of the Botanic Gardens of the Straits Settlements, Singapore, who had specially procured a quantity of the seeds for Messrs. Burroughs, Wellcome & Co., of London. We had thus the assurance that the material was perfectly authentic.

The seeds are relatively small, the weight of thirty being about 1 Gm. When crushed, they develop a peculiar cheese-like odour, reminding of some of the fatty acids. The kernel of the seed possesses an intensely and persistently bitter taste. Before proceeding to a complete examination the following preliminary experiments were made:—

Test for Alkaloid. Ten Gm. of the powdered seeds were

digested with Prollius' fluid and filtered. The filtrate left an oily residue, which, when treated with acidulated water, gave no reaction for alkaloid.

Extraction with various Solvents. In order to ascertain the general character of the constituents, 50 Gm. of the seeds were extracted successively in a Soxhlet apparatus with the following liquids. After removing the solvents, the residual extracts were kept in a water-oven until of constant weight.

1. Petroleum (b.p. 40–50°)	gave	10·88 Gm.	=	21·76	per cent.
2. Ether	„	0·17 „	=	0·34	„
3. Chloroform	„	0·65 „	=	1·30	„
4. Alcohol	„	1·92 „	=	3·84	„
				27·24	„

The petroleum extract was a light yellow oil, very sparingly soluble in cold, but soluble in hot alcohol, and separating on cooling. The ether and chloroform extracts were resinous, and of a greenish-brown colour. When warmed with a little water and filtered, the solution from the ether extract was only faintly coloured by ferric chloride, while that from the chloroform extract gave a deep purple-brown colour. The alcoholic extract was dark brown, and of a resinous nature. When taken up with a little hot water and filtered, the aqueous liquid gave a deep olive-green colour with ferric chloride, was coloured intensely yellow by alkalis, and reduced Fehling's solution. When acidulated it gave reactions with the usual alkaloid reagents, which were evidently due to soluble proteid substances.

Test for an Enzyme. 100 Gm. of the ground seeds were macerated with water at the ordinary temperature for three days, and to the filtered liquid about three times its volume of alcohol was added. After standing a few hours, the flocculent precipitate was filtered off, washed with a little alcohol, and dried over sulphuric acid. The yield of product was 3 Gm. It was a grayish powder, which dissolved readily in water, forming a brown solution. The latter, when acidulated with acetic acid, was rendered slightly turbid by the usual proteid reagents. When a little crystallized amygdalin was brought into an aqueous solution of the substance, or into a mixture of the crushed seeds with water, the odour of benzaldehyde was rapidly developed. In contact with potassium myronate the odour of mustard oil could not be so positively recognized. Although the substance obtained

by the above method was necessarily impure, it is evident that the seeds contain a hydrolytic enzyme.

Quantitative Determination of Tannin. As most of the drugs employed in the treatment of dysentery contain more or less tannin, and as the presence of such a substance had been indicated by the preceding experiments, it seemed desirable to determine the amount contained in Kô-sam seeds. Twenty Gm. of the powdered seeds were extracted with successive small portions of boiling water, and the cold, filtered liquid diluted to the volume of 250 c.c. Fifty c.c. of this liquid when evaporated, and the residue dried in a water-oven till of constant weight, afforded 0·600 Gm. of extract. Another portion of the liquid was allowed to macerate with hide powder for two days. Fifty c.c. of this filtered liquid, when evaporated and the residue dried, as before, till of constant weight, afforded 0·527 Gm. of extract. From these results the amount of substance absorbed by the hide powder, which is to be regarded as tannin, corresponds to 1·8 per cent. of the seeds. It was observed that, even after prolonged treatment with hide powder, the liquid still gave a greenish colour with ferric salts, but this was due, as will be seen later, to a substance differing essentially from tannin.

Separation of the Constituents of the Seeds.

After the preceding experiments a larger quantity of materia was operated upon as follows: 4 kilos of the finely ground seeds were extracted in a percolator with cold alcohol, but as this removed but a small proportion of the fatty oil it was followed by light petroleum, which removed a large amount, and the extraction was then finally completed with alcohol. After distilling the petroleum and alcohol from these liquids, the residues were combined, a little water added, and steam passed through the mixture, in a distilling flask, in order to separate any volatile substances. The distillate had a strongly acid reaction. It was first shaken out with ether, and, after the removal of the latter, there remained a small amount (about 1·5 Gm.) of a brown, limpid liquid, which had the characteristic odour of the bruised seeds. On distillation, under ordinary pressure, it passed over between 100 and 190° as a faintly yellow liquid, having an odour suggestive of the ethyl esters of butyric and valeric acids. It was accordingly hydrolyzed with an alcoholic solution of potassium hydroxide, steam distilled, and the distillate, which contained some oily drops, extracted with ether. After drying the latter liquid, and remov-

ing the ether, a very small amount of an oil was obtained, which had a somewhat aromatic odour, but which could not be further examined. The alkaline liquid remaining from the hydrolysis was acidulated with sulphuric acid and steam distilled. The clear acid distillate was treated with barium carbonate, filtered and evaporated, when a very small amount of a light yellow syrup was obtained, which afforded the reactions indicative of the barium salt of a butyric acid. The original aqueous distillate, which had been extracted with ether, was neutralized with barium carbonate. After filtering and evaporating, a syrupy liquid was obtained, which, on standing for some time, formed a crystalline mass. Its aqueous solution gave with silver nitrate a dense white precipitate which soon became black, owing to reduction, thus indicating the presence of formic acid, which was apparently associated with a very small amount of acetic acid. After separating the volatile substances, there remained in the distilling flask a mixture consisting of a dark coloured oily layer and a lower aqueous liquid. These were separated, the oily layer was diluted with light petroleum, filtered, and the petroleum removed by distillation.

1. *Fatty Oil.*

The total amount of oil obtained was 803 Gm. or 20 per cent. of the original drug. It had a dark green colour, due to the presence of chlorophyll. Its density at 17° was 0·917. When a little of it was shaken with a mixture of nitric acid and water, and subsequently heated for a few minutes in a water-bath, it formed, after standing for a few hours, a soft, brownish-yellow mass. 725 Gm. of the oil were hydrolyzed by boiling with 185 Gm. of potassium hydroxide, previously dissolved in alcohol. The alcohol was then distilled off, the residual strongly alkaline soap mixed with sand, dried, and extracted in a Soxhlet apparatus with light petroleum.

(*a*) *Neutral Constituents of the Oil.* After the removal of the petroleum, a yellow, viscid oil was obtained, which had a peculiar odour. This was dissolved in hot glacial acetic acid, and, on cooling, a quantity of minute needle-shaped crystals was deposited. This crystalline substance was collected, washed with a little glacial acetic acid, and dried on a porous tile. It was then dissolved in boiling ethyl acetate, from which, on cooling, it separated in beautiful glistening leaflets, and when dried on a porous tile formed a lustrous mat. It melted at 67–8°. When again

crystallized from ethyl acetate its melting point remained unchanged, and it was not affected by a further crystallization from absolute alcohol. 0·1390 Gm. gave 0·4310 CO_2 and 0·1845 H_2O. C = 84·6; H = 14·7. $C_{31}H_{64}$ requires C = 85·3; H = 14·7 per cent.

This substance was thus found to be a hydrocarbon. It was nearly insoluble in the usual organic solvents at the ordinary temperature, but more readily soluble in the hot liquids. When dissolved in dry ether it did not decolourize a solution of bromine in the same solvent. In all its properties it appears to be identical with the saturated hydrocarbon, hentriacontane, $C_{31}H_{64}$ (m.p. 68·1°), which has hitherto only been found in nature in beeswax. (Compare Beilstein's *Handbuch der org. Chemie*, i. 107.)

Although solid hydrocarbons, of both the aliphatic and the aromatic series, have been found in various essential oils (*Chem. Centralb.*, 1902, ii. 1117), comparatively few have been more directly isolated from plants, and these do not appear to have been very precisely identified. (Compare *Amer. Journ. Pharm.*, 1888 p. 321.)

The glacial acetic acid mother liquor from which the hydrocarbon was first obtained, deposited, on standing, a further amount of crystalline product, which was collected, dried, and recrystallized in the first instance from the first ethyl acetate mother liquor from the hydrocarbon, and finally from absolute alcohol. As thus obtained it melted between 70 and 85°, and, though obviously a mixture, it indicated some substance having a higher melting point than the hydrocarbon. The glacial acetic acid mother liquor, after standing for several days, afforded a still further amount of a white, crystalline product, which melted indefinitely between 110 and 130°.

The ethyl acetate mother liquor afforded, on evaporation to dryness, a crystalline residue, which melted like the above product between 110 and 130°. All the higher melting substance was then combined and recrystallized many times from absolute alcohol. The final product, representing the portion least soluble in alcohol, melted indefinitely between 112 and 129°. It was analysed. 0·1304 Gm. gave 0·3937 CO_2 and 0·1438 H_2O. C=82·3; H=12·2.

This substance gave with chloroform, together with acetic anhydride and sulphuric acid, a colour reaction resembling that shown by the cholesterols and allied substances. The cholesterols, $C_{26}H_{44}O$, require, however, C=83·9 and H=11·8 per cent. The discrepancy in the figures could not be attributed to the presence

of the hydrocarbon, which might seem likely from the melting point and a consideration of the very sparing solubility of the hydrocarbon in alcohol, since this requires 85·3 per cent. of carbon.

The several alcoholic mother liquors obtained in the course of separating the fraction melting at 112–129° were ultimately combined and concentrated to a very small volume. From this liquid there separated a fraction, exceeding in amount the preceding one, which melted at 130–131°. It was recrystallized from absolute alcohol without appreciably altering its melting point. On analysis 0·0412 Gm. gave 0·1240 CO_2 and 0·0456 H_2O, C=82·1; H=12·3. 0·1228 Gm. gave 0·3699 CO_2 and 0·1307 H_2O. C=82·1; H=11·8.

When again crystallized from absolute alcohol it melted at 130–132°. On analysis 0·1270 Gm. gave 0·3868 CO_2 and 0·1376 H_2O. C=83·0; H=12·0; $C_{20}H_{34}O$ requires C=82·8; H=11·8 per cent.

A determination of its specific rotation, in chloroform, gave the following result: $\alpha = -0° 54'$; c=2·388; l=1 dcm. Hence $[\alpha]_D^{23°} = -37·7°$.

When a small amount of the substance was dissolved in about 2 c.c. of chloroform, 20 drops of acetic anhydride added, and subsequently 1 drop of concentrated sulphuric acid introduced, a transient rose-pink colour was produced, changing successively to blue, green, and, on long standing, to brown.

Several substances corresponding to the formula $C_{20}H_{34}O$, which in their general character appear to be related to the cholesterols, have already been found in various plants, and designated respectively as quebrachol, cupreol, and cinchol or cinchocerotin. (Compare Beilstein's *Handbuch der org. Chemie*, 3 edit., band ii., 1068.) It is therefore probable that, like the cholesterols, they constitute a distinct class of substances.

(*b*) *Acid Constituents of the Oil.* The soap resulting from the hydrolysis of 725 Gm. of oil, and which, after being dried, had been thoroughly extracted with light petroleum for the removal of the neutral constituents, as previously described, was then dissolved in hot water. The aqueous solution was acidulated with hydrochloric acid, when the acids separated in the form of a semi-solid layer on the surface of the liquid. They were taken up with ether, the solution washed with water, dried with calcium chloride, and the ether removed. The residual oily liquid was then distilled under a pressure of 50 mm. It commenced to distil at 240°, but only a few drops passed over up to 260°, between which point and 270° the remainder distilled as a light yellow oil. The most

constant point during the distillation was between 262 and 265°, when but little remained in the distilling flask.

The iodine value of these mixed fatty acids, as determined by the Hübl method, was found to be 97·2. As oleic acid has a theoretical iodine value of 90·07, this result indicated the presence of a still more unsaturated acid, such as linolic acid, which has a theoretical iodine value of 181·43, especially as it was subsequently proved that some saturated acids were also present.

After standing for several hours the distilled oil formed a paste, owing to the separation of a quantity of crystals. This paste was then filtered with the aid of a pump, and the crystalline portion well pressed between folds of filter paper, in order to more completely free it from adhering oil. It was subsequently dissolved in warm 90 per cent. alcohol, and set aside to crystallize. The recrystallized acid was obtained from this alcoholic solution in three successive crops. The first crop was dissolved in light petroleum, and the solution soon deposited a quantity of beautiful glistening leaflets, melting at 68–69°. A solution of the acid in dry ether did not decolourize a solution of bromide in the same solvent. For analysis a portion was again crystallized from light petroleum, but without the melting point becoming changed.

0·1010 Gm. gave 0·2795 CO_2 and 0·1176 H_2O. $C = 75·5$; $H = 12·9$.
0·1065 Gm. gave 0·2954 CO_2 and 0·1242 H_2O. $C = 75·6$; $H = 12·9$.
$C_{18}H_{36}O_2$ requires $C = 76·1$; $H = 12·7$ per cent.

It is evident that this substance was stearic acid.

The alcoholic mother liquor from the first crop of crystals afforded a smaller second crop, which was recrystallized from 90 per cent. alcohol, when it melted at 55–56°. This was further treated in conjunction with a second batch of crystalline product which had separated from the oily mixture of acids after the above first filtration. The alcoholic filtrate from the second crop of crystals finally deposited a third crop. This was small in amount, handsomely crystalline, and melted at 53–54°. After recrystallization from 90 per cent. alcohol, it melted at 54°. On analysis 0·1389 Gm. gave 0·3800 CO_2 and 0·1568 H_2O. $C = 74·6$; $H = 12·5$; $C_{16}H_{32}O_2$ requires $C = 75·0$; $H = 12·5$ per cent.

This substance was undoubtedly palmitic acid.

Further evidence of this was afforded by an examination of the second batch of crystalline product from the original mixture of acids. This product was first recrystallized from 90 per cent. alcohol, when it melted at 53–54°. It was then combined with the before-mentioned second crop from alcohol, and the whole

again recrystallized from 90 per cent. alcohol. It then melted at 57–59°, and distilled under 50 mm. pressure between 240 and 265°.

A portion of the oily acid, from which the above-described crystalline acids had separated and had been removed from the liquid by filtration, was converted into a lead salt by heating with an excess of lead carbonate and a little water on a water-bath. The product was a homogeneous mass, which on cooling became hard. It was disintegrated and extracted with hot ether, the solution filtered and shaken with an excess of dilute hydrochloric acid. The ethereal solution of the liberated fatty acid was then washed with water, dried with calcium chloride, and the ether removed. The residual light yellow liquid when distilled under a pressure of 50 mm. passed over chiefly at 261–264° as a nearly colourless oil. On cooling slightly below the ordinary temperature, a small amount of colourless, crystalline leaflets separated out. The oily acid thus obtained was analysed with the following result: 0·1177 Gm. gave 0·3269 CO_2 and 0·1265 H_2O. C=75·7; H=11·9. 0·0957 Gm. gave 0·2644 CO_2 and 0·1032 H_2O. C=75·3; H=12·0.

Oleic acid, $C_{18}H_{34}O_2$, requires C=76·6; H=12·0 per cent.

Linolic acid, $C_{18}H_{32}O_2$, requires C=77·1; H=11·4 per cent.

A determination of the iodine value of this liquid acid, by Hübl's method, gave the figure 99·5, which is appreciably higher than the theoretical value for pure oleic acid, and the analytical figures are also not in agreement with the latter. As palmitic acid, $C_{16}H_{32}O_2$, requires C=75·0; H=12·5 per cent., the above results, together with a consideration of the action of nitrous acid, would seem to render it probable that the oily acid was composed of a mixture of oleic and linolic acids, together with some palmitic acid which had evidently not been completely separated by the process of purification through the lead salt.

2. *Constituents of the Aqueous Liquid.*

It has been previously stated that after the distillation of the volatile substances, by steam, from the combined petroleum and alcoholic extracts of the seeds, there remained in the distilling flask an upper layer of fatty oil and a lower aqueous liquid, which were separated.

The aqueous liquid was turbid and did not afford a clear filtrate, owing apparently to a small amount of suspended resin. It was therefore shaken once with ether, which rendered it perfectly clear. The ether solution was distilled, and the residue therefrom,

together with some resinous or other substances that had been obtained by filtering the petroleum solution of the fatty oil, was mixed with clean sand, dried and extracted in a Soxhlet apparatus, first with light petroleum, then with chloroform, and subsequently with alcohol. On finally extracting with water, nothing more was dissolved. The petroleum had extracted only a few grammes of dark-coloured, fatty matter. From the chloroform extract an appreciable amount of dark-coloured substance was obtained, which was further treated in connection with a larger amount of substance subsequently obtained by extracting the above aqueous liquid with chloroform. The alcoholic extract was concentrated and poured into water, when a small quantity of resin was precipitated, which, when dried, formed a dark brown powder and was not further examined.

The aqueous liquid, clarified by shaking with ether, had a reddish-yellow colour, an intensely bitter taste, and a strongly acid reaction. It gave a deep green colour with ferric chloride, an intensely yellow colour with alkalis, a dense precipitate with tannic acid, and abundantly reduced Fehling's solution. It was shaken with six successive portions of chloroform, when finally nothing further was extracted. After the removal of the chloroform by distillation, a quantity of a dark brown, very viscid syrup was obtained. The latter, together with the residue obtained from the previously mentioned chloroform extract, was dissolved in hot alcohol, filtered, and the hot alcoholic liquid poured into a quantity of boiling water. This aqueous liquid was then rapidly filtered from some dark brown resin, evaporated to a small volume, mixed with prepared sawdust, and heated on a water-bath until quite dry. It was then extracted in a Soxhlet apparatus with dry ether. This slowly removed a substance which was only sparingly soluble, for it separated as a faintly green-coloured, granular crust on the bottom and sides of the flask whilst the extraction was in progress. The extraction was continued until nothing further was removed. The substance was collected, packed into a smaller Soxhlet apparatus, and again extracted with dry ether, when it was obtained in the same form as before, but much lighter in colour. The amount of this substance actually obtained was 6·5 Gm. For the purpose of comparison it will subsequently be referred to as "bitter principle (*a*)." It had the following characters:—

Bitter Principle (*a*). It is a fine, granular powder of a greenish tinge, due to a trace of chlorophyll. Its taste is intensely and persistently bitter. Its melting point is very indefinite, but below

100°. It contains no nitrogen. Numerous attempts were made to obtain this substance in a crystalline form, but without success. There was, therefore, no assurance of its being an individual substance. Nevertheless, merely for the purpose of a comparison with quassin, which Heckel and Schlagdenhauffen have so confidently stated to represent the chief bitter principle of Kô-sam seeds, it was analysed. 0·1373 Gm. gave 0·2950 CO_2 and 0·0863 H_2O. C=58·6; H=7·0. 0·1364 Gm. gave 0·2932 CO_2 and 0·0838 H_2O. C=58·6; H=6·8.

The colour of its solution in chloroform did not permit of determining its optical rotation. It is very freely soluble in absolute alcohol and in chloroform, but very sparingly soluble in ether, even when warm. It is also very sparingly soluble in cold water, more readily on warming, and the solution becomes turbid on cooling, but the separated substance shows no tendency to crystallize. The aqueous solution slightly reduces Fehling's solution, and apparently to no greater extent after it has been heated with an acid. It is precipitated by tannic acid, and gives a deep brownish-black colour with ferric chloride.

The dry substance gives with concentrated sulphuric acid a brown colour, and about the same coloration with nitric acid. It dissolves, with a yellow colour, in a 10 per cent. solution of potassium hydroxide, and is re-precipitated on the addition of an acid. It is also soluble in a concentrated solution of sodium carbonate, forming a yellow solution.

Four grammes of the bitter principle were fused with 20 Gm. of potassium hydroxide, and the mixture kept at a temperature of 200–220° until frothing ceased. The dark brown melt was taken up with water, acidulated with sulphuric acid, and steam distilled. The acid distillate was neutralized with barium carbonate, filtered, and evaporated, when it formed a light yellow syrup, which became crystalline. The solution of this salt reduced silver nitrate and mercuric chloride, and, when heated with a little alcohol and sulphuric acid, developed the odour of ethyl butyrate. The volatile products of the fusion, therefore, consisted chiefly of formic acid, with apparently a little of a butyric acid.

The acid residue from the steam distillation was saturated with ammonium sulphate and shaken out several times with ether. The ethereal solution was washed, dried, and the ether removed. The residue was a light brown varnish, from which nothing crystalline could be obtained. Its aqueous solution gave a brownish-black coloration with ferric chloride.

In order to compare the characters of the above-described bitter principle (*a*) with those of quassin, which, as recorded in chemical literature, are somewhat conflicting, a specimen of "crystallized quassin" was procured. It was perfectly white and crystalline, but was recrystallized from hot absolute alcohol, from which it separated on cooling in fine white glistening needles. It then had the following characters:

It melted sharply at 252–253°. On analysis 0·0645 Gm. gave 0·1584 CO_2 and 0·0424 H_2O. C = 67·0; H = 7·3. 0·1173 Gm. gave 0·2889 CO_2 and 0·0773 H_2O. C = 67·2; H = 7·3.

Various formulæ have been assigned to the substances designated as quassin, but the above figures would agree best for the formula $C_{28}H_{36}O_8$, which requires C = 67·2; H = 7·2 per cent.

A determination of the specific rotation, in chloroform, gave the following result: $[\alpha]_D = +0° 56'$; c = 2·8; l = 1 dcm. Hence $[\alpha]_D = +33·3°$.

It was only moderately soluble in hot absolute alcohol, and, on cooling, separated almost immediately in fine, glistening needles. It was very sparingly soluble in cold, more readily in boiling water, from which, on cooling, it separated in small, glistening needles. It did not reduce Fehling's solution, nor did it give any colour with ferric chloride. It was slowly soluble in a cold 10 per cent. solution of potassium hydroxide, but without resinification, which had been stated to take place in the case of quassin.

The dry substance afforded with concentrated sulphuric acid a bright emerald-green colour, soon changing to yellow. Concentrated nitric acid causes no change of colour.

In Beilstein's *Handbuch der org. Chemie*, 3rd edit. iii. 646 the characters ascribed to quassin are in some respects essentially different from the above, as will be seen from the following description there recorded. "Fine needles. Melting point, 210-211°. Very readily soluble in alcohol, acetic acid and chloroform, but sparingly soluble in ether. In chloroform $[\alpha]_D = +37·8°$. Soluble in free alkalis, but not in alkali carbonates, and is resinified by alkalis. Its aqueous solution reduces Fehling's solution, but is not coloured by ferric chloride.

In Schmidt's *Pharm. Chemie*, 3rd edit. ii. 1516, it is stated regarding quassin that "concentrated sulphuric acid dissolves it without colour, and on the addition of a little sugar a red coloration is produced. When fused with potassium hydroxide it affords protocatechuic and acetic acids."

The results of the above comparative experiments render it evi-

dent that the bitter principle (*a*) isolated by us from Kô-sam seeds differs in many important respects from quassin, and, with reference to the method of purification employed, it cannot be considered at all probable that it contains the latter.

The aqueous liquid, from which the above-described bitter principle (*a*) had been extracted by shaking several times with chloroform, was then further examined. It still possessed a strongly bitter taste. On the addition of basic lead acetate a dense, yellow precipitate was obtained, which was separated with the aid of a pump, and washed with a little water. This precipitate and the filtrate therefrom were then separately treated as follows:—

A. *Basic Lead Acetate Precipitate.* This was suspended in water, decomposed by hydrogen sulphide, and the liquid filtered. The filtrate had a bright yellow colour, and gave a deep green coloration with ferric chloride. When concentrated, it formed a reddish-yellow syrup, which after standing for two weeks showed no sign of crystallization. It was then mixed with prepared sawdust, thoroughly dried, and extracted successively in a Soxhlet apparatus with ether, chloroform, ethyl acetate, and absolute alcohol. The ethereal extract afforded a very slight, crystalline residue, the alcoholic solution of which gave a deep emerald-green colour with ferric chloride. The residue from the chloroform extract was also very slight, but amorphous, and gave a similar coloration with ferric chloride. The extractions with ethyl acetate and with alcohol afforded rather darker coloured liquids, from which nothing crystalline separated. After distilling off the respective solvents, the residues from the latter two extracts were mixed, and, suspecting the presence of some substance of the quercetin type, the whole was dissolved in warm alcohol, to which a concentrated solution of 20 Gm. of potassium acetate in hot alcohol was subsequently added. (Compare *Journ. Chem. Soc.*, 1899, **75**, 433.) As this afforded nothing crystalline the alcohol was removed, the residue taken up with water, and the aqueous solution, after being saturated with ammonium sulphate, shaken out many times with ether. The ethereal liquid, which had a bright yellow colour, was washed once with water, dried with calcium chloride, and the ether removed. The residue gave a bright green colour with ferric chloride and a deep yellow colour with alkalis, but afforded nothing crystalline; on the addition of water only a tarry substance was obtained.

B. *Filtrate from Basic Lead Acetate Precipitate.* After the removal of the lead by hydrogen sulphide, and filtering, a yellow

liquid was obtained, which, when concentrated, formed a reddish-yellow syrup. It was allowed to stand for two weeks, but nothing crystalline separated. It gave no precipitate with tannic acid, as the original aqueous liquid did before the extraction of the bitter principle with chloroform, and it was only very slightly coloured by ferric chloride. It still possessed, however, an intensely bitter taste, and abundantly reduced Fehling's solution. It was therefore mixed with prepared sawdust, thoroughly dried, and as in the case of the lead acetate precipitate, extracted successively in a Soxhlet apparatus with ether, chloroform, ethyl acetate, and absolute alcohol. Both the ether and chloroform extracts afforded only very slight residues. The ethyl acetate and alcohol extracts were dark in colour, and afforded only syrupy residues, which contained an abundance of a reducing sugar, whose osazone melted at 204–205°.

Although it was to be presumed that if any quassin were contained in the seeds it would have been completely removed by the method employed in the isolation of bitter principle (α), yet as Heckel and Schlagdenhauffen have indicated in their paper (loc. cit.) that they separated what they assumed to be quassin by extracting the alcoholic extract of the seeds with amyl alcohol, it was thought desirable to subject the above-mentioned, very bitter, ethyl acetate and alcoholic extracts to a similar treatment. The residues from these two extracts were therefore mixed, dissolved in water, and the liquid shaken out many times with hot amyl alcohol. This afforded a dark coloured liquid, which was washed with water, and the amyl alcohol removed by distillation under diminished pressure. A considerable amount of a dark coloured, amorphous extract was thus obtained, which possessed a very bitter taste. An attempt was made to purify it by dissolving in warm ethyl alcohol, mixing the solution with prepared sawdust, and after thoroughly drying, extracting successively in a Soxhlet apparatus with ether, chloroform, and absolute alcohol. All these extracts afforded amorphous residues, which were dark in colour, possessed a bitter taste, and reduced Fehling's solution.

These experiments afforded ample evidence that the bitter principle (β) contained in the aqueous solution, after the removal by chloroform of bitter principle (α), is essentially different from the latter, and also that it is not quassin.

The powdered seeds, which in the beginning had been thoroughly extracted with light petroleum and with alcohol, were dried, and a portion finally extracted with hot water. This

afforded a very dark coloured liquid, which was concentrated and mixed with alcohol, when a considerable amount of gummy matter was precipitated. The filtered liquid, after the removal of the alcohol, was mixed with prepared sawdust, dried, and extracted in a Soxhlet apparatus with strong alcohol, but it yielded nothing of interest.

Summary and Conclusions.

The results of this investigation may be briefly summarized as follows:—

Kô-sam seeds contain no alkaloid. The amount of tannin found was 1·8 per cent. They contain a small amount of a hydrolytic enzyme. The combined alcoholic and petroleum extracts of the seeds afforded the following substances: A small amount of an inconstantly boiling mixture of esters, probably of a butyric acid, and having the odour of the crushed seeds; also a very small amount of free formic acid.

A fatty oil, in an amount equivalent to 20 per cent. of the seeds, consisting chiefly of the glycerides of oleic, linolic, stearic, and palmitic acids, associated with a saturated hydrocarbon, hentriacontaine, $C_{31}H_{64}$, m.p. 67-68°, and a crystalline substance, $C_{20}H_{34}O$. The latter melts at 130-133°, and has $[\alpha]_D^{23^\circ} = -37{\cdot}7^\circ$; it is allied to the cholesterols, and agrees in composition with quebrachol, cupreol and cinchol. (Compare Beilstein's *Handbuch der org. Chemie*, 3rd edit., ii. 1068.)

Two Bitter Principles. One of these (α) was completely extracted by chloroform from an aqueous solution of them, which also contained a quantity of a reducing sugar, and a very small amount of some substance which caused the solution to give a deep green colour with ferric chloride, but which was not isolated. Bitter principle (α), which was thus soluble in chloroform, was subsequently obtained from ether, in which it is only sparingly soluble, as a light coloured amorphous powder. Bitter principle (β), which was insoluble in chloroform under the conditions mentioned, could only be obtained as a brown extract. It was definitely shown that neither of these bitter principles can be regarded as quassin.

The results of this investigation, therefore, do not enable us to confirm the statement of Heckel and Schlagdenhauffen (loc. cit.) that Kô-sam seeds contain quassin, of which they have in fact presented no satisfactory evidence, nor do they afford any justification of the statement of Bertrand (loc. cit.) respecting the glucosidal

nature of a bitter principle which he has termed "kosamine." It is to be noted, moreover, that Bertrand has given no indication of having actually isolated any definite substance to which such a name could properly be attached. Although mentioning its insolubility in certain anhydrous solvents, and that it is not precipitated by either neutral or basic lead acetate, by means of which it is stated that it may be separated from such substances as oil, resin, acids, etc., there is still no evidence that the principle to which he attributes the activity of the seeds was obtained in any more definite form than an aqueous solution, which must also have contained a considerable quantity of sugar.

A correct conclusion respecting the active principle of Kô-sam seeds could apparently only be formed when some definite constituent of them, such as the bitter principle (*a*), isolated by us, is tested clinically with reference to its particular value in the treatment of dysentery. It is more probable that the therapeutic value of the drug depends upon the combined action of its constituents.

In this connection, it would seem desirable to ascertain whether other parts of this plant, such as the bark, may not be as efficient as the seeds, since the latter are somewhat difficult to obtain in quantity. It would also be of interest to determine, by a comparative examination, the constituents of the closely-allied Abyssinian plant, *Brucea antidysenterica*, which, on account of the properties indicated by its name, is highly esteemed in its native country.

Mr. HOLMES congratulated Dr. Power on an excellent piece of work, which would probably be even more appreciated in the East than in this country. The native name resembled that of a drug used in Japan, the root of a species of *Sophora*, and, with the view of preventing accidental substitution of one for the other, he suggested that the botanical name should be used for the drug rather than the vernacular one. It was remarkable that whilst European medical men used ipecacuanha as a sheet anchor in dysentery, Eastern native doctors almost invariably used very bitter drugs, such as *Holarrhena antidysenterica* and *Alstonia scholaris*. He ventured to suggest that these bitter drugs probably acted as a substitute for bile, the absence of which was usually indicated by the pale colour of the faces in most zymotic diseases. The first time that the seeds of *Brucea sumatrana*

were presented to the Museum of the Society was many years ago, by the late Dr. De Vrij, who was for some time resident in Java, where he had noticed the frequent use of the drug in dysentery and malarial fever.

Dr. POWER said he used the name Kô-sam, because it seemed to be the current expression in all the preceding papers on the subject. He agreed with Mr. Holmes that it was better to use the botanical name.

The best thanks of the Conference were accorded to Dr. Power.

A FALSE CUSPARIA BARK.

BY EVELYN WM. POLLARD, B.SC. (LOND.),
Pharmaceutical Chemist.

During last year (1902) a quantity of bark, supposed to be cusparia, found its way into London commerce. Samples of this bark were sent for identification to the Curator of our Museum by two of the largest wholesale houses. Mr. Holmes was unable to identify it, and kindly gave me a sample for inspection, subsequently putting me into communication with one of the firms, who generously forwarded me several pounds to operate on. The only information this firm could give was that it was probably *Angostura braziliensis* or *Cusparia trifoliata* from Columbia. I had not proceeded far in the histological examination when it struck me that a bark described by Barclay in his *Manual of Materia Medica* as a false cusparia corresponded with the bark I had in hand. Mr. Barclay forwarded me a sample of his bark, and the two proved to be identical. This, therefore, is not the first time the bark has occurred in commerce. I cannot do better than quote Barclay's description:—

"Recently (1894-5) a bark (origin untraced) has been met with as a substitution of angostura bark, which has the following characters: In flat or slightly incurved pieces of varying length and width, and from one-sixteenth to one-eighth or rarely as much as three-eighths of an inch in thickness. The outer surface of a grey-brown colour, rough from the presence of many wart-like excrescences of the periderm, and frequently bearing closely adherent lichens of a yellow or yellowish-red colour, marked with numerous black spots; beneath the corky layer the colour is dark greenish-grey. The inner surface is coarsely striated longitudinally, and in colour yellow, yellowish-brown, and brown. Fracture

hard, brittle, showing numerous, closely-adherent concentric laminæ. A transverse section under the microscope shows

FIG. 1. Exterior View of Bark.

numerous concentrically arranged large groups of sclerenchymatous cells."

I would lay stress on this last character, which is represented in Fig. 2, and also add that the taste is intensely bitter and slightly aromatic.

Histological Examination.

A thin transverse section (Fig. 3), when examined with ¼ in. objective, shows the following characters:—

(*c.*) Cork Cells. Tabular cells about five deep, the outer ones much disorganized.

(*p.*) Phellogen. A layer closely abutting on the cork cells, loaded with protoplasmic contents and giving rise internally to—

(*ph.*) Phelloderm. A conspicuous layer of regular tabular cells ten to twenty deep and filled with chlorophyllous contents.

(*bast.*) Bast Tissue occupying almost the entire section, and composed of alternating layers of hard and soft bast.

(*h.b.*) Hard Bast consists of ten to twenty layers of thickened cells. The layers near the phellogen are not continuous, but the inner ones are remarkably uniform, giving the laminated appear-

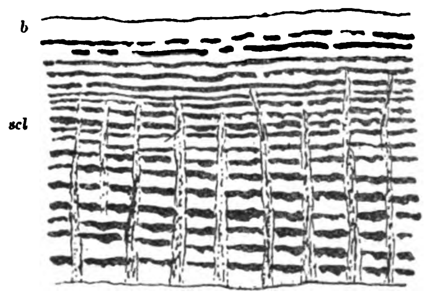

Fig. 2. Layer of bark, *b*, with concentric layers of sclerenchyma, *scl*.

ance to the bark. Each layer is two to four cells deep, and is translucent in thin sections. In these cells (Fig. 4) the lumen is almost obliterated; striations are very distinct, and slit-like pits (Fig. 5) are numerous. When isolated by maceration the cells are roughly isodiametric; they are "stone cells," and not of the nature of "bast fibres." Crystals occur in this region.

(*s.b.*) Soft Bast. This consists of layers of parenchymatous tissue. In thin pieces of the bark these layers are wider than the sclerenchyma layers, the cells being twenty deep, but in thick pieces the layers approximate in thickness. The cells are for the most part thin-walled, oval in transverse section, with the long axis tangential; while in longitudinal section they are seen to be distinctly elongated. Some of the cells have undergone some thickening (Fig. 6). Most are packed with small starch grains, and many contain albuminous matter and oil.

(*med.*) MEDULLARY RAYS. These are inconspicuous, except in a thick transverse section (Fig. 2), where they appear as dark, radiating lines. In a thin transverse section (Fig. 3) they can be most readily seen when crossing a sclerenchyma layer. They are two cells wide, the cells greatly elongated in the radial direction, having dark contents.

CELL CONTENTS.

1. CRYSTALS. Prismatic crystals of calcium oxalate occur in abundance; they are large and confined to the region of the sclerenchyma. Sandy or cluster crystals and raphides are entirely absent.

2. STARCH. The cells of the soft bast are loaded with small oval or rounded starch grains.

3. PROTEIDS in cells of the phelloderm, soft bast, and medullary rays.

4. OIL is scattered in minute droplets throughout the bast parenchyma; there are no special oil cells.

It will thus be seen that the histology of the bark under consideration differs markedly from that of true cusparia in having (1) well-developed sclerenchyma; (2) absence of raphides; (3) no special oil cells.

A chemical examination was undertaken to ascertain whether the bark contained any of the active constituents of true cusparia. It is scarcely necessary to say that cusparia contains several alkaloids, but the most easily extracted is cusparine, which gives a beautiful crystalline yellow sulphate.

CHEMICAL EXAMINATION OF THE BARK.

The bark gave evidence of containing an alkaloid. An attempt was, therefore, made to isolate this alkaloid in the following manner:—

A kilo of the bark in No. 20 powder was moistened with 1 per cent. hydrochloric acid; this moistened bark gave out an aromatic "peppery" odour. The mass was tightly packed in a percolator, and distilled water passed through till extraction was complete. An extract of 1 in 5 was of a dark sherry colour. An attempt to shake out the alkaloid with ether-chloroform and ammonia resulted in an emulsion which refused to separate. Basic lead acetate was, therefore, added, whereby an abundant light-coloured precipitate was obtained. The excess of lead in the filtrate was removed by dilute H_2SO_4; the solution was now of a pale lemon

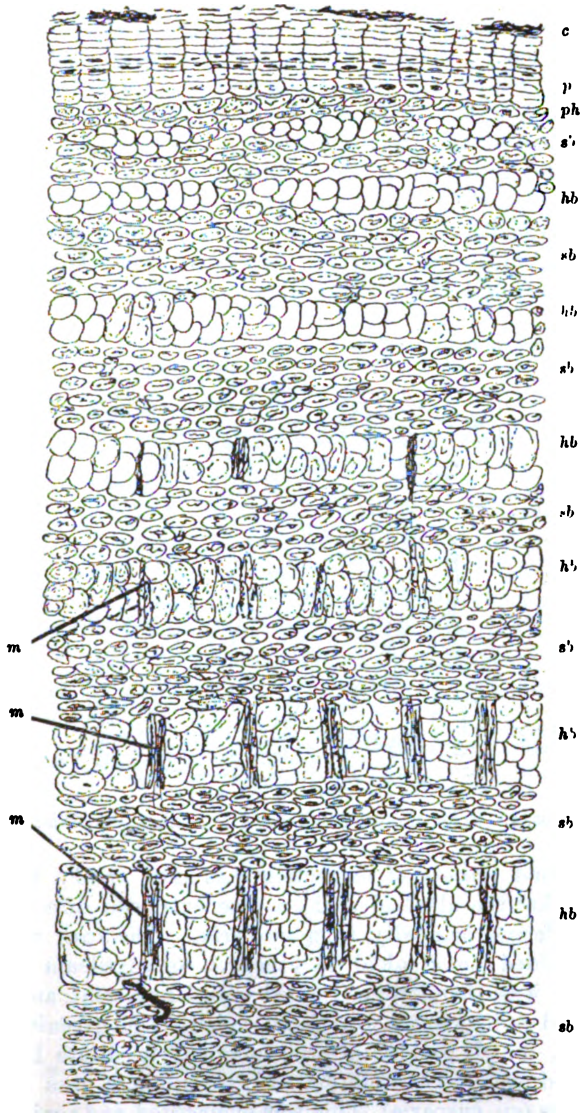

Fig. 3. Transverse section, showing cork, *c*, phellogen, *p*, phelloderm, *ph*, soft bast, *sb*, hard bast, *hb*, medullary rays, *m*.

colour. This was slowly evaporated over a water-bath; during

this process a quantity of perfectly colourless crystals separated, which, on analysis, proved to be calcium sulphate, evidently derived from the calcium oxalate which is largely present in the bark. When the solution was reduced to about 500 c.c. ammonia was added, which produced a copious pinkish precipitate. This precipitated alkaloid was filtered off, washed, and dissolved in just sufficient dilute H_2SO_4. Then filtered through animal charcoal, again thrown out by ammonia, washed and dried. The result was a small quantity of amorphous powder, which gave alkaloidal reactions, but which was by no means pure alkaloid. I was unable to obtain it in a crystalline condition.

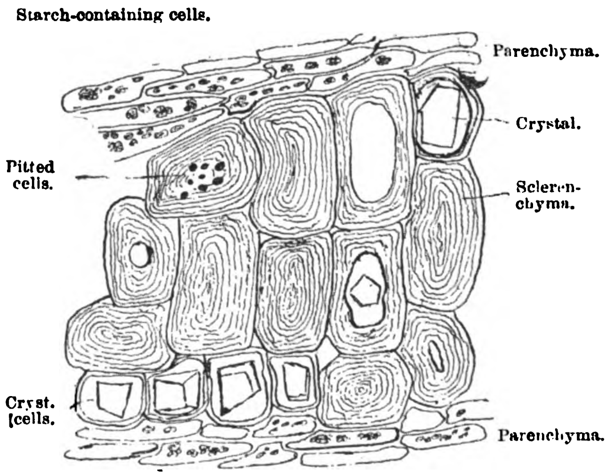

FIG. 4. Sclerenchyma Cells and Crystals (⅛ in. Objective).

A second process of extraction was now tried: Experiment proved that the alkaloid could not be extracted direct by ether, thus differing markedly from cusparia. The bark mixed with lime yielded no alkaloid to ether or to petroleum spirit. A quantity was, therefore, moistened with 10 per cent. ammonia and extracted with warm petroleum spirit. A greenish solution resulted, which yielded all the alkaloid to dilute H_2SO_4, and separated well. The solution of the sulphate was practically colourless (*cp.* cusparia). This was evaporated, and again inorganic crystals separated. When the solution became very concentrated, a viscous liquid separated, having the appearance and consistency of treacle. This was separated, washed with a little water, and

when dried in a desiccator formed a clear varnish. It was dissolved in hot absolute alcohol, which solution, on cooling, deposited a non-crystalline precipitate, which again dried to a clear varnish. This was undoubtedly a somewhat coloured, but nearly pure

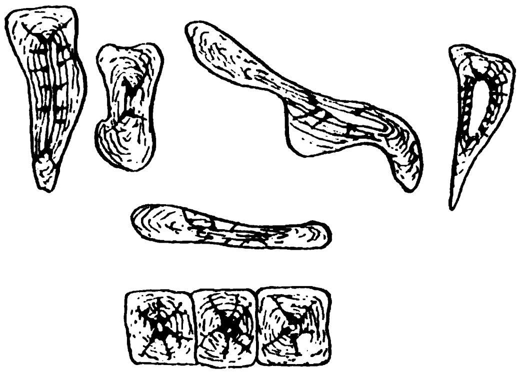

FIG. 5. Isolated stone cells.

sulphate of the alkaloid. After repeated transference from acid to ether, it still retained this slight coloration. A solution of this sulphate was used with the following results:—

Sodium carbonate caused a precipitate in such a fine state of

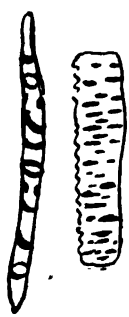

FIG. 6. Parenchyma elements, showing thickening.

division that filtration through a treble filter was of little avail. Nitric acid, oxalic acid, and potassium iodide all caused curdy precipitates readily soluble in hot water. The tartrate and hydrochloride, like the sulphate, were very soluble salts. I was

M M

unable to obtain any of them in a crystalline condition, either from water or alcohol. The alkaloid gave no coloration with strong H_2SO_4, but assumed a blue-black colour when chromic acid was introduced. Gold chloride formed with it a chocolate-coloured precipitate, the melting point of which was 105° C. (uncorr.). Assayed by Keller's process, the bark yielded 1·3 per cent. of alkaloid. Petroleum spirit, ether, chloroform, all extracted a quantity of oily matter, which was aromatic, having an odour of gorse flowers. This oily matter heated left a non-aromatic fixed oil.

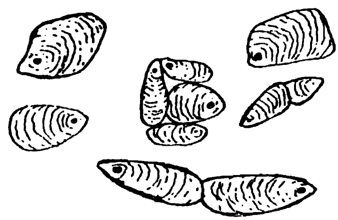

FIG. 7. Starch grains.

The chemistry may thus be summarized: (1) A bitter amorphous alkaloid; (2) fixed and volatile oil; (3) abundant starch; (4) calcium oxalate.

The chemistry of the bark, therefore, like the histology, is entirely different from true angostura bark. I have no information concerning the physiological action of the alkaloid extracted.

In conclusion, I am indebted to Messrs. Potter and Clarke for a liberal supply of the bark, to the B.P.C. Committee for a grant to carry on the work, and to Mr. Holmes for his kindly help throughout the investigation.

Mr. HOLMES said that he was much indebted to Mr. Pollard for the investigation of this bark. He had received samples for identification some years ago, and was unable to trace either its botanical or its commercial source. The structure seen under a lens was unlike any other bark known to him, except perhaps that of pomegranate, which in taste and other characters differed much from it. Mr. Pollard was one of the most promising pupils in the School of Pharmacy at Bloomsbury Square a few years ago, and it was a matter of congratulation that the school turned out men

who could do such excellent work. Mr. Pollard had now placed pharmacists in the position of being able to prevent the false cusparia bark from coming into use, and to recognize it if it should accidentally do so. It was remarkable that a bark, which no student who had studied at a good school of pharmacy should ever for a moment confound with cusparia bark, should actually find its way into the wholesale and even into the retail trade, notwithstanding the fact that it had been pointed out when it first appeared in this country that it was not cusparia.

Mr. GERRARD (Birmingham) said this paper was a very valuable contribution to the knowledge of the active principles of drugs. There were one or two points that rather nonplussed him. In regard to the addition of lime to the powdered or crushed drugs did Mr. Pollard moisten it with water? Of course he stated that he added 10 per cent. of ammonia, but was that 10 per cent. by volume or 10 per cent. solution of ammonia added to the drug? He was not acquainted with any simple alkaloidal salt which in moderately-strong solution gave a precipitate with nitric acid. He should like to know if Mr. Pollard had any explanation to offer on that point.

Mr. POLLARD thanked Mr. Holmes for his kindly remarks. In reply to Mr. Gerrard, he might say that he used 10 per cent. of ammonia gas in water, and moistened the lime, but he found that was unsatisfactory. As regards the addition of nitric acid to the solution of the sulphate, he only wrote down what he saw, but he believed there were alkaloids whose nitrates were insoluble.

Mr. J. RUTHERFORD HILL (Edinburgh) asked if it was not possible to have an acid sulphate formed which would be much less soluble in the acid solutions.

Mr. W. WATSON WILL (London) pointed out that there were several insoluble nitrates, and mentioned bererbine and jervine.

A vote of thanks was accorded to Mr. Pollard for his paper.

NOTE ON COMPOUND TINCTURE OF BENZOIN.

BY ALFRED WRIGHT,

Pharmaceutical Chemist.

In June, 1901, a chemist at Birmingham was summoned for selling compound tincture of benzoin containing only 82 per cent.

of the solid extract required by the B.P. The analyst's report showed that the sample only contained 147 Gm. (in 1,000 c.c.) of solid extract, whereas according to the B.P. there should have been 183 Gm. Eventually the summons was withdrawn, the Somerset House authorities having stated that the sample bore no evidence of being below the strength of the compound tincture of benzoin made according to the particulars prescribed in the British Pharmacopœia. Subsequently Dr. Hill, in his quarterly report to the members of the Health Committee of Birmingham, stated that his standard for calculation was 180 Gm. of solid extract per litre, a standard which had been advocated by a well-known manufacturing chemist, and also by the analyst to the Chemists' Defence Association. A sample prepared in his own laboratory yielded 182 Gm. per litre, and twenty-three samples bought from various chemists in the city and submitted to him by the inspector since the issue of the 1898 British Pharmacopœia gave an average of 180 Gm.: the average of the whole of the samples received, including two adulterated ones, was 176 Gm. Of those twenty-five samples, the two referred to, containing respectively 115 and 147 Gm. of solid extract, were certified as adulterated, and the vendors were prosecuted and fined £20 and £5 respectively; two, containing 158 and 169 Gm. of solid extract, were somewhat deficient in strength, and the remaining twenty-one samples contained 174 to 201 Gm. In the face of those figures Dr. Hill stated that he could not conscientiously pass a sample containing only 147 Gm. per litre as genuine, as he felt it was neither fair to the public nor to careful chemists and druggists, as it put a premium on the use of inferior ingredients. Dr. Hill thought it probable that the sample in question had not been made from benzoin alone, but from benzoin and bark, and how the chemists at Somerset House could give the certificate they had excited his wonder and passed his comprehension, unless they made for their guidance a standard tincture from benzoin and bark instead of from benzoin. Six other samples of compound tincture of benzoin received during the quarter were of satisfactory strength, containing from 175 to 186 Gm. of solid extract per litre. Subsequently a letter written by Mr. T. Dunlop was printed, in which the writer stated that he had made two half-pints of tincture, one with Siam benzoin (in tears), the other with Sumatra benzoin (containing 17 per cent. of barky matter, an equivalent for this being taken). The former evaporated till it ceased to lose weight, gave 22 per cent., the latter 23 per cent. of

solid extract. Mr. Dunlop concluded with an expression of opinion that a tincture with only 14·7 per cent. of extractive was no credit to the individual.

With these statements before me, I thought it might be of interest to the members of the Conference if I endeavoured to ascertain how far in practice the figures given by Dr. Hill were in accord with figures obtainable from tinctures sold to the public. I therefore procured commercial samples of the various drugs used in the preparation of the tincture, the samples being such as could be purchased in the ordinary way of trade from the wholesale houses. The drugs were assayed, and gave the following figures so far as regards solubility in B.P. alcohol:—

Socotrine aloes	83	per cent.
Balsam of tolu	94·25	per cent.
Storax purified by pure spirit	89·5	per cent.
Storax purified by methylated spirit	91	per cent.
Storax unpurified	58	per cent.
Siam benzoin, first quality	95·5	per cent.
Siam benzoin, second quality	96·75	per cent.
Sumatra benzoin, first quality	96·25	per cent.
Sumatra benzoin, second quality	67·25	per cent.
Sumatra benzoin, third quality	73·25	per cent.

With these drugs I then prepared half-pint samples of compound tincture of benzoin and obtained the following results:—

—	Specific Gravity.	Amount of Extractive per Litre.
Siam benzoin, first quality	0·892	200·2 Gm.
Siam benzoin, second quality	0·892	200·4 Gm.
Sumatra benzoin, first quality	0·892	200·2 Gm.
Sumatra benzoin, first quality, with unpurified storax	0·887	162 Gm.
Sumatra benzoin, first quality, with methylated spirit purified storax	0·892	190·1 Gm.
Sumatra benzoin, second quality	0·885	172 Gm.
Sumatra benzoin, third quality	0·887	194·2 Gm.
Sumatra benzoin, third quality, with unpurified storax	0·892	148 Gm.

I then proceeded to obtain specimens of the tincture from various parts of England, Scotland, and Wales. I asked that with each

sample I might be informed whether the tincture was home-made or purchased from a wholesale house, and I have therefore so classified the results:—

Home-made.

—	Specific Gravity.	Amount of Extractive per Litre.
Sample 1	0·8925	160 Gm.
Sample 2	0·891	184 Gm.
Sample 3	0·878	140 Gm.
Sample 4	0·895	204 Gm.
Sample 5	0·867	106 Gm.
Sample 6	0·885	172 Gm.
Sample 7	0·890	163·8 Gm.
Sample 8	0·8875	176 Gm.

Made by Wholesale Houses.

—	Specific Gravity.	Amount of Extractive per Litre.
Sample 1	0·8825	142·2 Gm.
Sample 2	0·892	164·2 Gm.
Sample 3	0·892	172 Gm.
Sample 4	0·882	154 Gm.
Sample 5	0·900	192 Gm.
Sample 6	0·875	143·8 Gm.
Sample 7	0·906	185·8 Gm.
Sample 8	0·8925	183·8 Gm.
Sample 9	0·8925	181·8 Gm.

Uncertain.

—	Specific Gravity.	Amount of Extractive per Litre.
Sample 1	0·892	174 Gm.
Sample 2	0·8725	122·2 Gm.
Sample 3	0·887	180 Gm.
Sample 4	0·8925	180 Gm.

The class "Uncertain" is of such tinctures that could not with certainty be included in either of the other classes. The

figures I have given represent in each case the mean of two determinations. The specific gravity was in all cases taken with the usual specific gravity bottle. The extractive was determined by evaporating 5 c.c. of the tincture to dryness on a water-bath until the weight was constant. Comparing the figures obtained from tinctures prepared by myself with the results from the tinctures from various sources, I am inclined to think that it is probable, in cases where the amount of extractive is low, that this may be due to the use of unpurified storax. I am also bound to admit that though at the outset I thought the standard proposed by Dr. Hill and Mr. Liverseege was too high in the result, I must agree with them that the adoption of a standard of 180 Gm. per litre is reasonable.

Mr. H. Wippell-Gadd said he could confirm Mr. Wright's results. He had corresponded with Dr. Hill concerning the cases mentioned in the paper, and there was no doubt that in this case the public analyst was right, a fact which might be due to his having a pharmaceutical chemist as collaborator. There were three reasons why tr. benz. co. of commerce was sometimes unsatisfactory —first, unpurified storax was used; second, impure benzoin was used; third, insufficient agitation. It was most important that compound tincture of benzoin should contain at least 18 per cent. of extractive. Their Irish friends said it must not contain more than 19 per cent. of extractive. That seemed rather extraordinary, but he thought it might be accounted for by presuming that the Irish drug contractors to the Poor Law Unions found it cheaper to put in a lot of extractive, and to leave out some of the spirit. He was of opinion that the alcoholic strength should be taken in conjunction with the percentage of extractive, and would provisionally suggest 75 per cent. by volume as a standard. He reminded the meeting that Siam benzoin, although it yielded more extractive than the Sumatra variety, had been stated by the late Mr. John Barclay to yield less free aromatic acids.

Mr. Rutherford Hill pointed out that about two years ago a paper was read before the Pharmaceutical Society at a meeting in Edinburgh by Mr. G. F. Merson, in which the same conclusion was arrived at as Mr. Wright had come to—viz., that where the amount of extractive was low it was due to the use of unpurified storax. Only Mr. Merson was a little more emphatic and carried Mr. Wright's inference practically the length of a demonstration.

He (Mr. Hill) was of opinion that the benzoin had very little to do with the low extractive, though no doubt insufficient agitation and consequent incomplete solution of the resins might be a contributory cause, but he thought it had been pretty conclusively shown that where there was a low percentage it was due to the use of unpurified storax.

Mr. Bird said unpurified storax often contained a considerable amount of water, which might affect the solubility of the resinous constituents of the benzoin and tolu. He would like to ask if Mr. Wright had ascertained the amount of alcohol in the tincture.

Mr. Thomson said that as one practically interested in the preparation of home-made galenicals he was disappointed with the figures given by Mr. Wright, as they showed that the excellent method suggested by Mr. Merson had not been adopted by the makers of the tincture. He had personally adopted the method, and found it to be very satisfactory. It ensured complete solution of the soluble constituents of the drugs, and tincture thus produced had almost invariably a specific gravity of 900 and an extractive value of 20 per cent.

Mr. Boorne (Bristol) said his experience coincided with that of Mr. Wright in that the Siam benzoin gave a higher extractive, but whether that was an advantage he did not know.

Mr. Holmes said that any one who had seen the Sumatra benzoin as it came into the London market would know that it was in the form of large cubical blocks, which contained purer benzoin in the centre than on the outer part, where it was mixed with bark and other impurities. That was not the case with the Siam benzoin, and he therefore recommended it to be accepted as the official benzoin. In regard to the amount of free aromatic acids in any benzoin, it would, of course, vary considerably, and he should be very pleased to supply specimens to any one who would undertake to investigate the matter. With regard to the liquid storax, it often contained a large quantity of water, which fact was, perhaps, an argument for the use of purified drugs instead of crude drugs.

Mr. Merson said reference had been made to his paper on the subject under discussion, and he might say that he examined the various grades of benzoin with the special object of finding out how much the extractive varied, and he was struck by the fact that it varied very little, there being little difference between the very drossy benzoin and the fine-grade Siam benzoin. The unpurified storax undoubtedly contained a large amount of water, and he thought the analysts who fixed certain standards for use in con-

nection with the Sale of Food and Drugs Acts were to blame for leaving it to the extractive. When the tincture was made with the liquid storax, the specific gravity was higher than it should be. He thought Mr. Wright's results bore out what other workers had found, and it was simply a hint that it was not always advisable to place too much reliance upon standards.

Mr. Druce said that, as a member of the Corporation of Oxford, he knew that they paid an analyst to examine the gas supplied to the city in order to ascertain whether it was of a standard quality; but since no notice was taken of illuminating power, but only of its freedom from excess of sulphur, and its being supplied at a certain pressure, atmospheric air pumped through the pipes would pass the required standard. And in the same way there were pharmaceutical preparations which were really valued for other properties than those recognized by the ordinary standard set up by the public analyst. He believed that in the days when pharmacists got the best drugs they possibly could, and themselves prepared their medicines from them, a far higher level of value was reached than that which obtained to-day when in many cases a certain arbitrary percentage of extractive was made the standard of excellence.

Dr. Symes said Mr. Holmes and others seemed to think that because the Sumatra benzoin varied in quality, and the Siam was more uniform, that therefore the Siam should be used exclusively in Pharmacopœia preparations. He was glad that Mr. Holmes spoke only from a materia medica standpoint, and not from a pharmaceutical point of view. If they compared Mr. Wright's figures for first quality Sumatra and first quality Siam, the amount of extractive was the same, and to exclude Sumatra from the B.P. would be shutting out a very valuable product. He thought they ought not to exclude a drug simply because it varied in quality, but that they should use their discretion and get the best.

Mr. W. F. Wells (Dublin) said he thought it would have been a great advantage if Mr. Wright had shown the relative medicinal values of the different preparations, and as to whether the extractive matter was of medicinal value or not. In Ireland, tincture benzoin comp. was very largely used for veterinary purposes, in which case the large amount of extractive matter may be of value. It is also used for inhalation, when he thought it likely the aromatic properties would be more important. It is a great mistake that the B.P. does not lay down a standard of quality for such prepar-

ations. In answer to Mr. Gadd he would like to say that in Ireland no man in his senses would think of taking the quality of drugs supplied to Irish Unions as his standard. It has been stated that the Local Government Board have found that the quality of drugs has improved. What he would like to know was the method of collecting the samples. He knew one case lately where the doctor was reprimanded for getting the contractor to make him up a dozen samples for analysis. The largest Poor Law drug contractors in Ireland are not pharmacists. They are either unqualified persons or druggists. The whole system of contracting is a bad one, and he begged them not on any account to take contract drugs as samples of the medicines used by pharmacists in Ireland.

Mr. Holmes said, with reference to the remarks which had been made by Dr. Symes, that statistics could be made to prove anything, and if Dr. Symes compared the figures given by Mr. Wright in connection with the second quality of benzoin, he would find that there was a considerable difference in both specific gravity and extractive

Mr. Watson Will said a good deal of the unpurified storax was used for making tincture. His experience was that the ratio of water in the crude storax ranged from 18 to 22 per cent.

Mr. Gadd said the explanation he had given as to the reason for the Irish authorities fixing a maximum of extractive was that given by Mr. J. C. Umney at Bloomsbury Square in November last. He had no intention of referring to the drugs supplied by the pharmacists in Ireland.

Mr. Boorne said with regard to the use of Sumatra and Siam benzoin, he thought the Sumatra was preferred on account of its possessing an aroma that the Siam variety did not possess. He knew of a case where some tincture made with Siam benzoin was returned by a retailer because he said it was not the genuine article. He said he wanted the tinct. benz. co. of the B.P., and he was quite certain that the article in question was not what he wanted. On analysis, the tincture was found to be quite up to the standard, but it was made with Siam instead of Sumatra benzoin.

Mr. Wright, replying, said he thought the fault lay in not properly making the tincture. It ought to be frequently agitated during the process of making, otherwise some of the drug would stick to the bottom of the vessel and would not dissolve. With regard to the medicinal value of Siam and Sumatra benzoins, he could not

make any observations, as he had not tried to ascertain that; he only knew by experience that people rejected the tincture made with the Siam benzoin. The only explanation he could give for that fact was that he found the Sumatra benzoin had a distinctly more aromatic flavour than the Siam, but whether it was more efficacious he could not say. He found on preparing the extractive from the tinctures that there was a considerable amount of volatile matter, not alcoholic, driven off. In reply to Mr. Bird as to whether he had estimated the alcoholic strength of the tincture, he wished to say that he had not tried to determine that. He was very pleased to hear the remarks of Mr. Boorne and Mr. Merson.

Mr. Boorne said he thought the explanation why tincture made with Sumatra benzoin was preferred was, perhaps, that the Siam benzoin has a distinct vanilla flavour.

The thanks of the Conference were then accorded to Mr. Wright for his paper.

THE FUTURE OF PHARMACY.

BY LEO ATKINSON.

The future of pharmacy must inevitably force itself on the consideration of members of the British Pharmaceutical Conference. The complex phenomena of joint-stock trading, as applied to pharmacy, has so revolutionized our avocation, it is well nigh out of recognition. At this Conference, primarily instituted to promote the welfare of our craft, it may not be out of place to endeavour to induce and stimulate a line of thought with the object of evolving some practicable scheme for the conservation of orthodox pharmacy as a retail business. It is abundantly evident that no contemplated legislation will afford even the semblance of protection for the professional side of our business: whether the proprietors of a business be qualified or unqualified is immaterial to the Government and the public, so long as the actual work of dispensing and handling scheduled poisons is confined to qualified subordinates. It seems impossible to make either the legislator or the "man in the street" understand that "pharmacy," in the nature of things, is *sui generis*, and cannot be conducted on competitive company lines without serious risk to the public, and the certainty that they cannot be supplied with trustworthy drugs. The difference between the best drugs and poor drugs in many instances involves the difference between life and death. The prevailing popular idea

is that the Food and Drugs Act is sufficient protection. The experienced pharmacist knows better. The wide latitude in gradations in quality and value of drugs (which the purchaser cannot judge) is the opportunity for the sharp, unscrupulous trader, and for this reason pharmacy has suffered more than any avocation from the encroachments of joint-stock trading.

The wide distinction between the vendors of drugs and medicines and vendors in every other trade where competition, from an economic standpoint, may be legitimate, has never been sufficiently accentuated. The purchasing public, whilst fairly critical connoisseurs in regard to textiles, art, furniture, and the ordinary necessaries of life, cannot possibly be competent to understand or estimate the quality of a drug; it is constantly alleged that pharmacists charge exorbitant prices for drugs and galenicals because the commercial or company chemists charge so much less. The truth is that the commercial druggist can realize much greater profit on low grade articles. Before a critical audience of experts this does not require further elaboration—still the unjust accusation of extortion remains. Is it to be wondered that so many fall by the wayside? There is the additional factor that the unqualified buyers of drugs for a joint-stock company are without the skilled knowledge necessary for differentiation, and the qualified subordinate (usually one of the weaklings of pharmacy) accepts the inevitable. The idea that qualified subordinates guarantee the public the protection the Pharmacy Act is assumed to confer is too ridiculous for serious argument.

The fundamental principle of the founders of the Pharmaceutical Society was unquestionably to advance the status of retail chemists and druggists. The Society have honourably carried out important educational work and faithfully fulfilled an implied contract with the State; on the other hand, owing to a loosely-drafted clause in the Act of 1868, the highest judicial tribunal has bound the unfortunate pharmacist hand and foot, and exposed him to the immoral, if not illegal, competition of every petty shopkeeper, one-man company, or dividend hunter under heaven.

Fifty years ago, in the evolutionary stage, no one could have foreseen that pharmacy, at a later date, would be thus strangled by acute commercialism. We have now to face the fact that the highest educational facilities provided out of the funds of the Society are no longer in any due proportion appropriated by those who propose adopting retail pharmacy as their future business.

It will be found a large percentage of those taking honours in

the Society's School never contemplate following as a business that which was the objective of the founders of pharmaceutical education, so that in effect we are educating and qualifying assistants for joint-stock companies. The natural inference from this condition of affairs must be that retail pharmacy, *per se*, no longer furnishes a livelihood commensurate with its responsibilities and educational requirements. Paradoxical as it may appear, year by year in ordinary retail there is less actual need for any great amount of specific pharmaceutical skill. The art of prescribing, for reasons too numerous to epitomize, is neglected by modern physicians, prescriptions are fewer, and the bulk of these consist mainly in repacking the various nostrums of advertising manufacturers—none too modest in literary mendacity. In the immediate future these factors, in relation to our business, will doubtless be intensified, so that to maintain any due proportion of professionalism in his work the pharmacist must branch out in several directions—optics, photography, bacteriology, mechanics, physical apparatus, etc.—though the technics pertaining to these is not included in present pharmaceutical scholastic training, neither is it retail pharmacy.

The elements of change may be noted in every direction; historic houses are departing from their traditions to meet a new order of circumstances, revolutionary change in medical practice and medicaments determine a corresponding change in the products of pharmaceutical manufacturers, seldom to the advantage, or requiring the intermediary skill of the competent pharmacist.

If this be the admitted condition of affairs, the question arises—Is retail pharmacy as a distinct avocation any longer a necessary, desirable, or possible factor in the body politic? Is the pharmacist as a specialist to become extinct? The Legislature imply that the disappearance of the pharmacist does not call for Parliamentary interference; hence we must work out our own salvation or be crushed out by circumstances we can neither govern nor control. It must be a matter of common observation that now in the general run of chemists' businesses the dispensing, drug, and medicine branch is becoming subordinated to departments of more extensive mixed trading; in fact, pharmacy is used as an attractive side-line for other and more lucrative trades. Owing to the attitude of the Legislature, the educational equipment of the up-to-date store chemist need not extend beyond a knowledge of keen commercial methods, the acquirements of a shop-walker, and arithmetical proficiency sufficient to supervise a mechanical till.

The ultimate commercialization of the drug trade is proceeding with amazing rapidity, independent of the possible State recognition of company pharmacy.

When this commercialization is entirely accomplished, and the individual pharmacist practically extinct; when the public have for a few years enjoyed the economic blessing of free trade in medicine and drugs, combined with a medley of articles of household use and consumption, with these elements of serious danger uncontrolled and encouraged by Parliamentary ineptitude, is it not conceivable in such circumstances history may repeat itself? The pendulum, held back in one direction, will, on liberation, swing a corresponding distance the opposite way. The antecedent condition of the drug trade and the catastrophe which led up to the Pharmacy Act of 1868 is well known, and once again a public danger may develop into a public scare, necessitating prompt legislative reform.

To meet such a contingency and finally evolve and establish professional pharmacy on a solid basis is the problem to be carefully considered, without hasty generalizations, so that the mistakes of the past shall not be repeated in the future. As an initial requirement I venture to suggest the formation of a Guild of Pharmacy, in no sense to clash with the parent Society. Such a Guild, in the light of past experience, would have disciplinary regulations and the machinery for controlling and maintaining internal integrity.

That such a desirable evolution is not entirely visionary or merely idealistic fantasy is negatived by the existence of numerous professional associations, many of which have been evolved and emancipated from conditions apparently as hopeless and incongruous as the condition of the drug trade to-day; as familiar examples take the Dental Association, Society of Actuaries, Chartered Accountants, Architects, British Medical, Incorporated and Law Society, and others. If, as we know, those associations have not found a practicable scheme for protection insurmountable, why should the pharmacist degenerate into a mere Jack-of-all-trades?

Conceiving, as I do, that the British Pharmaceutical Conference is the most suitable body to take the initiative is my apology (if one be necessary) for suggesting some additional organization whereby, should favourable circumstances arise, we should be prepared to seize the opportunity and restore the pharmacist to public confidence and esteem in the legitimate discharge of responsible duties, not alone to his individual advantage, but with advantage to the community.

Mr. PECK said he thought their thanks were due to Mr. Atkinson for his very valuable paper. It appeared to be full of truths and bristling with suggestions the value of which was incalculable. Time would not that morning allow them to have a full discussion of the subject, and he trusted that the idea of a Guild of Pharmacy would be taken up and discussed in the press. As one of the Secretaries of the Conference, it would be somewhat discourteous if he neglected to allude to the statement that the British Pharmaceutical Conference was the most suitable body to take the initiative in this work. This he hardly felt to be the case. It was said in the paper that the Guild would have full disciplinary power, and he expected one of the rules would be that each member of the Guild would be a pharmaceutical chemist, or a qualified chemist and druggist. That was not one of the constitutional objects of the Conference, and that was one reason why he thought they would hardly be right in undertaking this work. Then, again, a Guild of this kind would be better able to do its work if left entirely free to adopt its own methods of procedure. The proceedings of the Conference and the work of the executive are, he took it, at the present time quite enough for them. At the same time, he saw no reason why the Guild should not be formed. He was quite certain it could do no possible harm, and he did not see why it should not meet during Conference week.

Mr. HARRY KEMP (Manchester) said he went to a very great extent with the writer of the paper, and thought that nothing but good could come from the institution of such a Guild as had been suggested. At the same time he pointed out that the associations mentioned by Mr. Atkinson had not succeeded in protecting their members from the unqualified practitioners any more than pharmacists were protected. They had found that what they aimed at and what they succeeded in getting were two different things. The Dental Association had not succeeded in suppressing illegitimate dentistry, and there were thousands of accountants who were not members of the Chartered Accountants' Association. He did not say this in any depreciatory spirit, but if a Guild of Pharmacy was established he warned pharmacists against expecting too much from it. He thought the subject would have been more suitable for discussion by the Federation than by the Conference.

Mr. DRUCE thought there was danger in multiplying the number of societies. He would rather use the Pharmaceutical Society by making it do its duty. But individual chemists must also do their duty. It was appalling how little unanimity could

be obtained on questions of vital importance to pharmacists as a body, for instance, in the matter of the recent decision of the Board of Inland Revenue, whch appeared to recognize the professional status of chemists who had been properly apprenticed. That recognition seemed in danger of being lost, because a few chemists were foolish enough to care more for a few paltry side lines. Then, again, in regard to pharmaceutical legislation, chemists must not try to get too much at once; they ought to be content if the present Pharmacy Bill secured for them the protection of titles without weakening its chances of passing through the Houses of Legislature by loading it with impossible, injudicious, or impractical details.

Mr. RUTHERFORD HILL said that in the Pharmaceutical Society they had what had always seemed to him ought to be the best possible Guild of Pharmacy that could be conceived. The constitution of the Society was such that it possessed all the splendid advantages of the old Guilds and was free from their defects. It seemed to him that if they wished to have a Guild of Pharmacy they had in the Society an organization which met all the conditions that Mr. Atkinson had suggested.

Mr. S. R. ATKINS said he spoke that morning with a new sense of responsibility, and he was sure that, whatever he might say, he should find somebody did not agree with him. Since becoming President of the Pharmaceutical Society he had received shoals of letters—they had even followed him to Bristol—which told him that pharmacy was passing through difficult and troublesome times, and the Council was very roughly handled by some of his correspondents. He wished to thank Mr. Atkinson for his masterly paper. Mr. Atkinson was a strong man, having strong convictions, and he had strongly expressed them—he was one of the many men who were in pharmacy and were also accurate scientists. He (Mr. Atkins) could not help wondering what would have happened if the paper they had listened to that morning had been presented to the Conference some years ago. He recalled the meeting at Exeter, when the late Daniel Hanbury presided, and a paper was submitted on "Pharmaceutical Ethics" by his friend, Mr. T. B. Groves. There was then a very solemn conclave as to whether such a dangerous paper ought to be read and discussed by the British Pharmaceutical Conference. What would have happened if Mr. Atkinson's paper had been submitted at that time he left to his friends to say. Mr. Atkinson had very justly and accurately described the disease, and it now remained to find the

remedy. Mr. Atkinson had made only one really practical suggestion—viz. the formation of a Guild of Pharmacy on the lines of the ancient Guilds which maintained a sense and code of honour and a code of ethical instruction. But he did not think Mr. Atkinson would be wise to press for that. He thought it would be better to press upon the Council of the Pharmaceutical Society what had been said in the paper, and he could assure Mr. Atkinson that it would be most anxiously discussed and considered. He agreed with Mr. Kemp that other professions suffered quite as much as pharmacists from unqualified practice, and even in such trades as grocery he was informed by a friend that it was difficult to make 10 per cent. He was strongly convinced that the future of pharmacy lay in the evolution of the thoughtful, cultured, scientific side.

Mr. NEWSHOLME said that Mr. Atkinson had read an exceedingly thoughtful paper, presenting many unpalatable truths, and they should profit by what he had put before them. The President of the Pharmaceutical Society had referred to the question of a code of honour in connection with Guilds, and for his own part he believed, like other speakers, the finest Guild was that of the Pharmaceutical Society of Great Britain. If all those who were registered under the Pharmacy Act were to try and observe some code of honour it would be better for the pharmacy of this country. If every individual registered chemist would think to himself what a code of honour meant they would never have had the present curse of limited companies and bogus companies. If each individual chemist had recognized a code of honour no one would have sacrificed himself in the way men had done to enable these limited companies to carry on business to the pharmacists' detriment. (Applause.) They would like to spend a great deal of time discussing Mr. Atkinson's paper, but this was not the occasion, and he thought it would have been better if it had been read before the Federation or some other body. Still, he was not blaming Mr. Atkinson for bringing it forward. Reference had been made to the Dental Association and chartered accountants. The latter were only a chartered body and had no Act of Parliament, but they observed a code of honour; and if their own people did the same thing they would have nothing to complain of.

Mr. G. D. BEGGS (President of the Pharmaceutical Society of Ireland), said one of the great causes of the present state of things in pharmacy was that chemists did not support the parent body as they ought. They in Ireland had not quite the same state of

affairs to contend with as chemists in England had, but they found that the young men, after passing the qualifying examination, lost all interest in the Society, and failed to support it. What chemists seemed to lack was backbone. He had been greatly interested in watching the progress of the Pharmacy Bill now before Parliament, but unless the Bill was properly supported he was afraid it would have a very rough time. In regard to the suggested Guild, he thought the Pharmaceutical Society was the most fitting Guild, if only the members would loyally support it.

Mr. A. WRIGHT (Yeovil) asked Mr. Atkinson if he had any proof that the Pharmaceutical Society had educated students at the school, and given them all its educational advantages, and then passed them on to the drug companies. He did not think that was the case. He knew that the most promising students entered the employment of the wholesale houses and manufacturers, but he did not believe they went over to the drug companies. Neither did he think that Mr. Atkinson was right when he said that the business of a chemist and druggist had passed away to the extent that pharmacy had become a sort of "side show," and the main trade consisted of other things. He thought that was a libel on chemists generally.

Dr. SYMES said it was quite true that a good many of the "racehorses" of pharmacy did not continue in the retail trade because they found their facilities were such that they could get into better employment, and it was quite proper that the "Square" should continue to educate men for that purpose. Pharmacy had always been a starting-point for a certain number of men to enter other professions. Many had passed on to the medical profession, and those present knew very well that the best prescriptions they had to deal with came from medical men who had started as pharmacists. When Mr. Atkinson said that the men who gave their services to the drug companies were the weaklings of pharmacy, and afterwards suggested that the Society educated the best men for the service of the drug companies, he could not reconcile the two statements. With reference to the remarks of Mr. Atkins that chemists should leave matters in the hands of the Council, he would rather that chemists joined the Society and became active members, and when the Council was considered to be not sufficiently active, to push it on.

Sir THOMAS ROBINSON (Dublin), who spoke at considerable length, and with great vigour, said he thought that the members

of the Pharmaceutical Council had allowed themselves to drift into a very pessimistic state of mind. He felt that chemists had the future in their own hands. The present state of affairs reminded him of the condition of things which existed when the old apothecaries were viewing with such great concern the proceedings of those who at that time sold Cockle's pills and similar preparations. Now he found that the Pharmaceutical Society of Ireland was looking with the same horror and disgust on companies as the apothecaries looked upon druggists a few years ago. He could not help feeling that to sneer at the men who gave their services to the companies was not the best way to conciliate them and bring them back to pharmacy. Referring to the business of a chemist and druggist, he said, in his opinion, it was a dangerous thing to lose sight of the business side of pharmacy, just as it was to lose sight of the professional side. Mention had been made of the Pharmacy Bill, and the difficulty of getting legislation. As one who had some experience of Parliamentary practice, he said emphatically that it was not a difficult thing to get legislation, but it was difficult to get an unreasonable Bill through Parliament. He believed that the present deterioration in pharmacy was due to the introduction into medicine of so many nostrums. So far as the limited company with which he was connected was concerned, he might say that no one could hold a share or be a director of the company unless he was a registered chemist.

Mr. ATKINSON briefly replied, and a vote of thanks was accorded to him for his paper.

BALEARIC BOTANY, 1903.

BY J. W. WHITE, F.L.S.

The papers read before this Conference are commonly the outcome of scientific labour undertaken indoors, often, no doubt, by light of a midnight lamp. To-day I am asking you to listen for awhile to an account of work done in the open air, for the most part in brilliant Balearic sunshine; for I am anxious that the sympathetic interest in field botany lately shown by our members should not subside, but rather be nurtured and encouraged, and I trust that this effort of mine may tend in that direction.

Well, the date was Monday, April 20, in the Easter vacation, and, as my fellow-traveller's engagements made it necessary for him to be again in Clifton on May 8, there resulted eighteen days for a

couple of botanists interested in the European flora to use to the best advantage. Now, if one wants to gather plants at that early period, it is before all things essential that one should go as far South as possible. And a careful comparison of maps and time-tables showed that we could certainly have a day or so longer in the Balearic Islands than in any other spot on the same parallel of latitude. Sicily we intensely desired, and Corsica we greatly longed to see; but the first was too far away, and from the second the return steamers did not fit in. We learnt also, on turning to the books, that we should certainly find in the Balearics a very remarkable and interesting vegetation, richer in extent and in quality than that possessed by any other European district of similar size. Taking the relative areas of Corsica and Sardinia combined, of Sicily, and of the Balearic Isles, it has been estimated that, while the first contained 1 endemic species in 933 sq. kilometres, and the second 1 in 336, the Balearics possess 1 in 95.

This group of islands, taken together, are about equal in area to our county of Somerset, and their native plants comprise nearly 1,400 species of flowering plants and ferns. Of that number more than 1,000 belong also to the peninsula of Spain, and almost as many to Italy, France and Algeria respectively, showing that when the vegetation is compared as a whole with that of neighbouring countries, an evident fact is that, excepting some species that are entirely special, and some others rare and little known, that give to it a peculiar character, the flora of the Balearic group is very closely allied to that of the countries named. But the striking feature of this flora is that it contains about forty species known to grow only in one other country, and fifty which are at present unknown elsewhere in the whole world.

At 9 a.m. on April 21 we left Paris for Barcelona, and twenty-four hours later set foot in that big Spanish port. There was time to look around, and for calls at the steamboat office and a bank; and it may be useful to note that one gets at least a peseta more for an English sovereign in Barcelona or Palma than is given in London. At 2 p.m. we were off for Minorca in a small steamer with very small engines, a good deal of cargo and a good many hours allowed for the voyage. We rolled along over the waves at about eight or nine knots an hour. My doings for the rest of that day and the night following are of no particular interest to anybody; but there was then developed the sole tinge of sadness that pertains to my recollection of the trip.

Going on deck next morning we were running along under the

low rocks of Minorca, and presently entered the splendid harbour of Port Mahon, passing on the left the graves of our soldiers, for whose loss and that of the forts they defended, Admiral Byng was condemned and shot. Masses of warm grey rock, houses tier above tier, dazzling white, with red roofs and bright green shutters, the "sapphire sea" below, and a sky of as deep a hue above, formed a scene not easy to describe, but which is familiar to most Mediterranean travellers. Before the vessel had moored we were boarded and welcomed by Don J. Rodriguez, the veteran naturalist, whose name is indelibly impressed on Minorcan botany. He had been advised of our coming by my old friend, Mr. E. M. Holmes, well known in Mahon and elsewhere as "le premier algologue Anglais." After lunch three gentlemen, botanists of Mahon, were introduced, and under their guidance we at once started on a walk to Cala Mesquida, a lovely bay four miles to the north-east, where many rare plants abound. On rocks skirting the road we saw a big shrubby wormwood (*Artemisia arborescens*), the largest European species, and *Capparis spinosa*, not yet in flower. Next, *Ferula communis*, a gigantic Umbellifer, 9 ft. high, two species of *Frankenia*, and two of Asphodel. The smaller Asphodel (*A. fistulosus*) is only about a foot high, while the larger (*A. albus*) reaches 4 ft. to 5 ft., and is among the commonest as well as the most ornamental plants in the islands, growing everywhere indifferently on the highest hills or on ditch banks in the lowlands. It appears that this plant bears locally three different names at three stages of its growth. Before the flowering stem appears it is "Purrasa"; when flowering it is called "Au Bo," and finally, when dry, "Caramusha." My informant insisted on this being written down, as he knew no similar instance. A strong spinous shrub, bearing delicious-looking yellow fruit, much like a small choice apple, next arrested attention. This proved to be *Solanum sodomæum*, an introduced species, and the fruit were "Dead Sea apples," handsome to look on, but utterly uneatable. Passing over some low hills we reached the beautiful coast, and came upon a wealth of rare plants. Yellow masses of *Ononis crispa*, most viscid and glandular, which when pressed seems to incorporate itself with the paper into one sticky mess, *Senecio Rodriguezii*, *Digitalis dubia*, a pale-coloured fox-glove, very soft and velvety, *Euphorbia imbricata*, *Lavatera minoricensis*, and *Vicia bifoliata*, all were found within a small compass. These are special Balearic plants, and the two latter grow only at Cala Mesquida. The fragile filiform stems of the little vetch have to be extricated from

the midst of prickly bushes, up through which they invariably grow, and to obtain them uninjured one must exercise all that patience and restraint in language for which the field botanist is noted. The number of spinous and prickly plants in the locality was remarkable. Thorns and prickles prosper well in that country, and fences are cheap and good. A thicket of *Oxycedrus juniper* overgrown with *Smilax* is quite unapproachable. But besides those, the *Calyeotome spinosa*, *Juncus acutus*, and other well-known species, there were scattered about among the stones many inviting mossy-looking cushions of close texture, hemispherical in shape, and often 4 or 5 ft. in circumference, tempting the weary pedestrian with their apparent softness. But, far from affording a comfortable seat to the wayfarer, these cushions of *Astragalus Poterium* are masses of interlacing needles, among which the small white flowers appear. Other similar, but coarser, cushions are formed by plants of *Sonchus spinosus*. From neither is it possible to prepare satisfactory specimens for the herbarium. *Asparagus horridus*, too, consists of little else than 2-in. spines, sharp and so tough and strong that I had to tread portions under foot to flatten them enough for pressing. Yet the young shoots of this plant are tender and edible, and they appeared to furnish all the table asparagus that was served during our stay in the islands. The coast thereabout reminded one of the choicest Channel Island scenery, but is even more rocky. Minorca is a solid mass of stone. The exposed surfaces weather in a curious way into sharp knife-edged ridges, and loose fragments lie in profusion everywhere. Returning in the twilight from that first excursion over a specially rough hillside, I asked one of our guides if the whole island were of that nature. "Oh, no," he said, "not at all; in many parts it is quite different—far more stony!" Quarrying is unnecessary, for building material lies at hand in plenty, and the difficulty is to clear land for cultivation. Thick walls bound the fields, and walls are often built around fruit trees, with the double purpose of giving them protection and of getting rid of the stones. Rubble masonry in the islands is marvellously well built and durable without mortar; and immense labour and patience are displayed in terracing hillsides for agriculture. But the people have been always skilful in the handling of stone, for does not ancient history tell us that the Baleares were the champion slingers of the world? Possibly they were more successful with their native pebbles than when, later, they took to using leaden balls; for one historian goes

so far as to say that the lead melted in the air from the extreme violence with which it was slung.

And the prehistoric masons of Minorca in remote antiquity possessed the art of building in high perfection. Their monuments —the *talyots*, *taulas*, and *navetas*, built of huge blocks and slabs, are well preserved at this day. They are peculiar to the Balearic Isles, have no affinity with the megalithic remains in other countries, and their purpose can only be conjectured.

The next morning we drove to Albufera. The dusty wayside was bright with flowers, among which Boraginaceæ were prominent. The deep blue of *Borage*, the varying violet and purple of many species of *Echium*, and the quieter hue of *Cynoglossum pictum*, furnished much of the colour. In striking contrast arose here and there tall spikes of *Celsia cretica*, the most showy plant in Minorca, with blossoms as large as a crown piece—yellow blotched with red. Other good things gathered thereabout included *Lepidium carrerasii* peculiar to Minorca; *Salvia clandestina*, *Ephedra fragilis*, *Ornithogalum arabicum*, *Briza minor*, and some rare Leguminosæ.

Several of our commonest species at home, such as the dandelion, daisy, and dead-nettle, are entirely absent from the islands. Their places are taken by plants of very different character. On waste ground everywhere is a pretty, graceful sort of thistle, *Galactites tomentosa*; and quite as common is the squirting cucumber, *Ecballium elaterium*. Sufficient of the drug grows wild in Minorca to supply the needs of a century at the present rate of consumption.

There is no pasture in the Balearics, and therefore few of the grasses that make our English hay; no cat's tails, foxtails, or dog's tails, nor in fact any species with the name *pratenis*. And, as a consequence, there are no milch cows and no butter. Goats, pigs, and sheep pick up what they can among the rocks, by the roadsides, and on the stubbles. Sheep, as the most dainty feeders, come off the worst. As they wander over the stones, gaunt and hungry, pitiful objects with every rib showing, they tell you plainly that it is useless to ask for mutton-chops in the islands. Cow's milk, beef and butter are city luxuries to be obtained only by much favour and many pesetas. The universal custom is to breakfast on a peculiar rich light bun or cake called "ensiamada," which is much more readily eaten than described. It is slightly indigestible, and with coffee or chocolate stands by one well until the midday meal.

It is vain to look for English hedgerow flowers that beautify our deep lanes and wood-borders in the springtime. There are no sweet violets, bluebells, or red campions; no golden celandine, stitchwort, or blue speedwells. We bruise no broad-leaved ramsons under foot and sniff their odour. Nor does marsh-marigold edge willowy copses with its splendid flowers. No upland fields are gay with gorse or daffodils, nor in the South does "modest wood-ruff scent the mossy shade." But yet our British hawthorn seems quite at home, flowering in April. We noted also the blackthorn, large nettle, and some docks. Oddly enough, the whole six Balearic geraniums are common Bristol plants. In all else no vegetation could be more unlike. The hillsides are covered with red and white cistus, lavender, genista, mastic and big shrubs of heath and rosemary and myrtle; while the undergrowth is often of several species of *Helianthemum* and Labiates, sprinkled with white flowers of *Cyclamen balearicum*, the "San Pera violet" of the natives. Here and there is a clump of the curiously-jointed *Ephedra fragilis*, a juniper, a pomegranate, or a fig, springing wild from clefts in the rock. Interesting and beautiful as are all these, they are excelled in Minorca by the plentiful and luxuriant *Euphorbia dendroides*, a most elegant bush when in bloom. The stem of this species is quite woody, and sometimes a foot or more in circumference. It rises in regularly three-forked branches into a beautiful pale green hemisphere 5 ft. or 6 ft. high. The largest trees are of *Quercus ilex*. Exposed to the constant sea gales, these are all bent and twisted to the southward by the prevailing wind. *Pinus halapensis* is the only native pine. Smaller and less picturesque than the cultivated species, it yet affords a pleasing prospect from the light green of its soft outspreading tufts of leaves.

The mastic (*Pistacia lentiscus*) in the Balearics, as on the Riviera, forms, as a mere bush, the chief constituent of the underwood. But a very old tree was pointed out to us in Minorca as one of the largest in existence. Its branches covered a space about 30 ft. in diameter, which would make it probably as large as the celebrated tree at Bordighera. In cultivation, instead of clover fields one sees great sheets of the vivid crimson flowers of *Hedysarum coronarium*, the Minorcan forage plant, that has been found well suited to a dry and windy climate.

At Albufera we came to a large fresh water lake with some brackish marsh between it and the sea. Here was abundance of *Leucojum Hernandezii*. We saw it later in Majorca, but else-

where it grows only in Sardinia. Near the water's edge were *Salicornia fruticosa* and *Suæda fruticosa*; and, close at hand, *Lavatera cretica*, *Lotus creticus*, *Melilotus messanensis*, *Vicia atropurpurea*, and *Scrophularia ramosissima*. On the shore were also some enormous tamarisks of great age, some of the trunks being 10 to 12 ft. in circumference. One object of this day's excursion was to obtain the *Daphne vellæoides*, Rodrig., abundant on the Isla Colom. Landing on that island from a fisherman's boat, we immediately came upon plenty of the rare and beautiful little shrub, bearing small white flowers low down upon the branches, and very evidently distinct from all other *Daphnes*. This reflection applies to all the Balearic rarities without exception. These endemic species are remarkable for the strikingly decided characters that separate them from their congeners. They, indeed, are "species of the first order." Hardly had our boxes closed upon the *Daphne* twigs than a fine *Arum* was sighted (*A. muscivorum*). its spathe resembling a hog's ear, reddish and very hairy. Here also many bulbs of the great squill (*Urginea scilla*) protruded from the scanty soil in all directions, some as big as a child's head. I learned that the natives are well aware of the medicinal properties of squill, and, moreover, have the practice of keeping a plant upon the staircase of each house as a charm against erysipelas. Then appeared the proprietor of the island, a singular figure. Clad in rags, rope sandals, and a battered straw hat, he was yet monarch of all he surveyed on that lonely rock. He was at pains to explain to us that our lovely *Arum* was a pest in his domain, and how fortunate it was that pigs would eat it, and, indeed, liked it.

On the following day, by the kindness of a local landowner, we were enabled to visit the Barranco de Algendar. Outside Mahon we met a fisherman running at full speed with a heavy basket on his back, and were told that the custom was always to run into town with a catch, sometimes from ten miles out. Our guide remarked further that his countrymen were a hardy race. The island, he said, swept by cruel winds and lacking water, produced barely enough to sustain the inhabitants. They, therefore, could never make full use of their digestive apparatus, and as most diseases, he believed, arose from keeping it too thoroughly employed, good health and long life resulted. The consumption of alcohol, however, threatened trouble, amounting, as it now did, annually to two dollars per head of the population. I fancy that there would be consternation here at home, also, if our use of intoxicants stood at that same figure, but the trouble would be

in the national exchequer and not in the temperance councils. But I feel sure that my Minorcan friend did not wish to be taken seriously. A land that can produce three crops of potatoes, and that wherever scratched by a primitive wooden plough is stated to yield half as much again as a similar area would upon the mainland, should not be despised. Any community that adheres to the main principles of temperance, plain living and abundant exercise will of necessity be hardy and long-lived.

The famous barranco is a fissure or cañon riven through the plateau of Miocene rock that occupies the whole of southern Minorca. Following a sinuous course of six or eight miles from near the centre of the island to the coast, its pinnacled rocks and precipices 200 ft. or 300 ft. high are grandly picturesque. A stream threads the bottom of the gorge, and cliffs alternately close in to make a dark, narrow cleft, through which the water rushes like a mill-race, or open out that the sun may play on the orange-gardens and sub-tropical vegetation that flourish at the bottom of the moist ravine, where the air is always soft and warm. Sheltered entirely from the high winds of the uplands above, this is one of the few spots in the island where palms and citrus fruits can reach perfection. *Laurus nobilis* attains the height of 50 ft., and rare plants are frequent along the rocky escarpments. *Pæonia corallina* abounds, a variety differing from our Steep Holms plant by its glabrous follicles. A decoction of the root is much used as a remedy for epilepsy. *Delphinium staphisagria*, also, is plentiful, and *Urtica pilulifera*, the most vicious and venomous of nettles. Other new species met with that day were *Viola stolonifera*, *Lotus tetraphyllus*, *Ononis minutissima*, *Sibthorpia africana*, *Micromeria Rodriguezii*, *M. filiformis*, *Scolopendrium hemionitis*, and *Selaginella denticulata*.

One of the last rambles from Mahon took us westward along the harbour to Villa-Carlos, a suburb founded by the British under the name of George Town. Here stand our soldiers' deserted barracks, untenanted since the occupation. When an English ship of war visits the place the bluejackets play football in the barrack square under windows from which their compatriots looked out a century and a half ago. Two *Mesembryanthemums* (*crystallinum* and *nodiflorum*) grow here on rocks by the sea, and the curious *Ophrys speculum* that has a mirror-like patch on its labellum. As we were discussing by the roadside a peculiar *Chlora* that seemed new to us, some Menorquins passed, and their remarks were translated by our companion as follows: "Oh, yes,

they are Americans. Most of the medicine that people take nowadays comes from America. They travel here and gather our weeds, and compound the remedies on their return."

Time will not permit me to do more than mention many things that could not escape observation; the dazzling cleanliness of the towns, the courtesy of the people, and their kindly feeling for everything English; and, beyond that, the manifest traces of a still existing influence of the old British occupation.

We left Minorca feeling that we would fain have stayed forty days instead of four, both on account of the intrinsic charm of the place, and the extreme kindness that we received from our Spanish *confrères*.

After a starlight passage on the night of the 27th, the sun rose as we entered Palma Bay, and its rays fell on the capital of Majorca, its great Gothic cathedral, its windmills, and its palms. A more enchanting scene cannot be imagined.

Majorca is the largest and most fertile of the islands. The soil is so rich, the climate so soft, and the natural scenery so beautiful, that many endearing names have been bestowed upon it throughout the ages. Approached from the sea, the aspect is more Oriental than European. And the more prominent vegetation—the abundant agaves, prickly pears, caroubs, and fine date palms, as also the dwarf native palmetto, *Chamærops humilis*, which covers many wild rock slopes by the sea, all give an Eastern colouring that harmonizes well with the old Moorish buildings, and with the fine mountains that glow in blues and purples beyond the Palma plain. This great plain, protected on the north and east by high ranges, of which the most elevated peaks reach 5,000 feet, is closely cultivated, and produces a long list of vegetables, cereals, and fruits. The attention of a stranger is arrested by the number of wind-sail pumps used for irrigation, and by the universal practice of planting almond and fig trees in the corn fields. The pruning of these fruit trees leaves them open in the centre to the sun, so that the amount of shade thrown in that brilliant climate is insignificant, and may even be beneficial to the crops. As regards other trees, *Quercus ilex* and the small native pine cover large tracts among the mountains, whilst the olive is more abundant in the lower regions, where it appears to have been cultivated from very ancient times. The giant olives of Valdemosa certainly must have been planted by the Moors, possibly 1,000 years ago. Gnarled, twisted, and contorted into fantastic shapes, the heartwood gone ages ago, and the outer

shells, though still vigorous and sustaining tall stems, often split into three or four separate trees, now standing several feet apart; these extraordinary trees are more suggestive of a monstrous vegetation imagined by a Doré or a Dante than of symbols of peace and amity. Of native timber in our sense of the term there is none in Majorca. The antiquated and expensive system of cooking by charcoal still prevails throughout the islands, with the result that practically all the large trees have been destroyed by the charcoal burner. A truly lamentable result of the demand for this costly and unwholesome fuel is that the beautiful Balearic box tree (*Buxus balearica*) known only in Majorca, and at one small spot in Spain, a handsomer and more elegant plant than our British species, has been almost completely destroyed. At one time it is said to have formed actual forests among the mountains. Some of the trunks attained the size of a man's body, and furnished wood for cabinet-making; but about the year 1851 they were all cut down and converted into charcoal. At the present time a few small bushes merely are scattered over the cordillera of the north. We ourselves found only two.

I am not going to weary you with a detailed account of excursions in Majorca, but will only note briefly the richness of our gatherings in the few localities we were able to visit. On the shores of Palma Bay and the slopes under Belver Castle grow a large number of rare plants, viz.: *Silene cerastoides*, *S. rubella*, *Arenaria procumbens*, *Helianthemum umbellatum*, *H. serræ*, *H. salicifolium*, *Fumana Spachii*, *Paronychia argentea*, *Anthyllis cytisoides*, *Ononis breviflora*, *Hedysarum spinosissimum*, *Bulbocastanum incrassatum*, *Linaria triphylla*, *Lavandula dentata*, *Sideritis romana*, *Avena bromoides*, *Lamarkia aurea*, *Ægilops ovata*, and *Æ. triariatata*.

Passing across the island to the mountain village of Pollensa, we made our way up the beautiful Val de Ternellas as far as Castel de Rey, and met with many Balearic specialities, viz. *Hypericum balearicum*, *Rhamnus balearicus*, *Rubia balearica*, *Smilax balearica*, *Polygala rupestris*, *Alkanna lutea*, *Vincetoxicum nigrum* and *Chamærops humilis*.

From Pollensa also we reached the charming hamlet of Ariant, lying to the north-east amid a circle of towering rock pinnacles. By the mule-path over the Col we saw *Delphinium pictum*, not yet in flower, and masses of *Phlomis italica*. On the coast beyond Ariant we were successful in finding the most interesting plant of the whole trip, the very latest discovery in the Balearic

flora. Six years ago Mr. Clarence Bicknell, on a journey through the mountains with mules, strayed from the track in a fog, and so came upon a new species of *Pimpinella* that now bears his name. Prior to our visit no botanist but himself had seen this plant growing, and without his instructions we should not have found the place. Sheltered among huge masses of rock fallen from stupendous precipices above, at a spot where another 1,000 feet of cliff shelves down to the sea below, *Pimpinella Bicknelli* is safe enough from man's interference. Although of robust habit, it may, of course, be a decadent or dying-out species under the ban of some inexplicable natural limitation, and if so its destiny will be worked out alone amid the solitude and desolation of that grand north coast. My fond hope is that some day I may revisit the spot at a time when the plant shall be in fruit, for that had not developed in April.

For the rest, there might be much to say on the beauty of Miramar, preserved in its pristine wildness by the Austrian Archduke Ludvig Salvator, a distinguished scientist, and the friend of all naturalists, who has there a house filled with Majorcan antiquities and works of art. On his domain we first saw *Hippocrepis balearica*, *Brignolia pastinacæfolia* and *Allium subvillosum*. And of charming Soller, too, the "Garden of the Hesperides," where loaded orange boughs bend to the earth, and the cool evening air is heavy with rich perfume of many flowers. All the fruit trees of Europe seem to flourish side by side in the groves of Soller. There we climbed on to the Sierra to the Col de Lofra, a twelve hours' tramp, to be rewarded with *Brassica balearica*, *Genista cinerea*, *Taraxacum obovatum*, and *Helichrysum Lamarkii*. There, also, we scrambled in the torrent beds of the Couma to get *Helleborus lividus*, *Pastinaca lucida*, *Linaria fragilis*, and *Scutellaria Vigineuxii*, the most delicate of Labiates. Very few folk indeed have ever met with the latter, for which one has to crawl between the boulders into crevices deep and damp. And, apart from botany, it is delightful to walk about the streets and look through widely open doors into the great tiled halls, spotlessly clean, and gay with palms and flowers, and get a glimpse at the far end of oranges and pelargoniums beyond. All the houses, rich or poor, stand wide open all the time, as if the people were desiring to show off their neatness and good taste to every passer-by. Door-bells are unknown, and knockers rare. If no one be at home the doors remain open just the same. The friendly, simple people are everywhere good-

natured and anxious to please. Not a beggar, tout, or ill-behaved person did we see in that fascinating land, where men and customs change but slowly, and where the people have all the virtues of those who mix but little with the outer world. They do not know the American or British tourist; no preparation has been made for him, and no one speaks his language. Who shall say that his coming is greatly to be desired?

Mr. E. M. Holmes said that it was much to be regretted that time did not allow the reading of the whole of Mr. J. W. White's valuable paper, which had evidently been prepared with great care, so as to render a subject usually considered to be dry as interesting as possible. Mr. White had a wide reputation on the Continent as a careful and accurate botanist, and his exquisitely prepared herbarium specimens were eagerly sought after for University herbaria. His important contribution to our knowledge of the botany of these little-visited islands would be read by botanists throughout the kingdom with great interest, and it would, Mr. Holmes felt sure, be greatly appreciated by a much larger audience even than that of the British Pharmaceutical Conference.

CRYSTALS IN EXTRACTS.

By F. H. Alcock, F.I.C.

In a paper read before the Midland Pharmaceutical Association, March 12, I called attention to some crystals which had been found by one of my friends in some extract of henbane. He thought they might be hyoscyamine, and sent them for inspection and examination. They were only shown at the meeting, and the weight of each crystal was recorded and subsequent examination was promised. At the meeting Mr. E. W. Mann suggested that they might be potassium nitrate, and a few days after the paper had appeared in the journals a communication was sent to me by the late Mr. John Barclay, which had been received by his firm from Mr. M. J. Ellwood, Leominster, who expressed great interest in the matter, and referred me to a paper in the *Pharmaceutical Journal*, November 19, 1870, in which he had recorded the presence of calcium oxalate in belladonna, and sug-

gested that probably "history would repeat itself," and these crystals would prove to be a similar sort of thing. These suggestions seem to show that their examination would be of interest to the Conference, but I fear results do not show much that was not previously known, for they proved to be fine crystals of potassium chloride, coloured with a little of the extract; by analysis they gave 99·8 per cent. potassium chloride.

A second example of crystals from extracts was obtained from a liquid alcoholic extract of *Anacyclus pyrethrum* root, and these were found to be potassium dihydrogen phosphate.

Another specimen of crystals from extracts has also come under my notice many times in recent years. In extractum carnis in large bulk there often may be seen crystals which are colourless, long, prismatic and transparent, weighing 0·25 to 1·0 Gm., or even more. These I have examined and found to be calcium tetra hydrogen phosphate—the soluble acid phosphate of calcium.

It would seem from the above examples that these crystals are not always of the same composition, and, as potassium nitrate, and also calcium oxalate, have been found, it is not safe to conclude that all extract crystals are one and the same substance.

The PRESIDENT said this was a most interesting paper. He had always thought that crystals would be found in extract of meat, and that they would be found to be potassium acid phosphate.

Mr. RANSOM said he had frequently noticed crystals in extract of hyoscyamus, and had always taken them to be potassium nitrate. He had, however, had the crystals examined after hearing about Mr. Alcock's paper, and they were found to be potassium chloride.

Mr. WRIGHT (Yeovil) said he had examined some crystals found in extract of aconite, and they proved to be crystals of potassium chloride.

Mr. BETTY asked how the crystals were formed in the extracts.

Mr. ALCOCK, in reply, said he was glad to get confirmation of his findings from such an authority on extracts as Mr. Ransom. As the formation of crystals was a general thing in green extracts, he was not surprised to hear that they had been found in extract of aconite. As to the reason of the formation of crystals in

extracts, that was an interesting question which he must hand over to Mr. Ransom.

A vote of thanks was accorded to Mr. Alcock.

NOTE ON HYOSCYAMUS MUTICUS.

By F. Ransom, F.C.S., and H. J. Henderson, Ph.C.

Hyoscyamus muticus, grown in India, was first examined by Dunstan and Brown, and the results are given in a paper read before the Chemical Society, and published in the society's journal in 1899 (*Trans.*, 1899, **75**, 72). The authors therein showed that the sample examined contained 0·1 per cent. alkaloid, consisting of practically pure hyoscyamine. In a subsequent paper the same authors reported on a sample of the plant grown in Egypt, which they also found to contain the same alkaloid in a pure state, and which existed to the extent of 0·87 per cent. in the seeds, and 0·59 per cent. in a mixture of the stems and leaves. Dr. Gadamer had previously examined the Egyptian plant, and found 1·34 per cent. of hyoscyamine in the seed capsules and seeds, 1·393 per cent. in the leaves, and 0·569 per cent. in the stems (*Arch. Pharm.*, 1898, **236**, 704).

Under the impression that a drug with powerful mydriatic properties, due exclusively to the presence of the alkaloid hyoscyamine, might present certain therapeutic advantages for galenical preparations over the official henbane, we were induced to make a further examination from a pharmaceutical standpoint. The material employed was supplied by Mr. Ernest A. Floyer, member of the Egyptian Institute. Three varieties of the drug were examined: (1) the light brown stalk, from which most of the leaf had been removed; (2) a compressed brick consisting mostly of leaf with small proportions of leaf-stalk and seed-capsules; (3) the unripe seed-capsules containing some seed.

We understand that the drug could be procured in any of these three forms, but the first is that which has hitherto been usually seen on the London market. In each case the material was carefully dried in a current of warm air at a temperature between 70 and 80° C., and the loss of moisture determined. 2 oz. of the dried material in No. 20 powder were packed tightly in a percolator and percolated slowly with 45 per cent. alcohol until exhausted. The

tincture was assayed by the following general method: 50 c.c. of the tincture were evaporated to about 20 c.c. over a water-bath, and transferred to a small bottle. 1 c.c. of HCl dil. was then added, and the tincture agitated with three successive portions of ether, which were collected and agitated with 5 c.c. of slightly acidulated water, the ether rejected, and the washings added to the bulk. The whole was now transferred to a separator, ammonia added in excess, and the alkaloid extracted with three successive portions of $CHCl_3$; the chloroformic solutions of the alkaloids were bulked, and the alkaloids again washed out with acid and extracted with $CHCl_3$. The chloroformic solution was drawn off into a tared dish, and allowed to evaporate spontaneously, and weighed after drying in the air oven at a temperature not exceeding 93° C. The residues before drying were beautifully white and crystalline, but on heating the crystals were fused into a yellowish mass. This method is practically the same as that employed by Dunstan and Brown in their researches. The results obtained by us were as follows:—

	Percentage Moisture.	Percentage Alkaloid in the Dried Drug.
1. Stalk, etc.	10	0·498
2. Leaf, etc.	18	0·900
3. Seed capsule	10	0·585

For the purpose of therapeutic examination, a tincture was prepared with 45 per cent. alcohol, and standardized to contain 0·01 per cent. alkaloid, by the method described above for the assay of the drug, this being about the strength which might be expected of the official tincture, prepared with best English biennial henbane. Specimens of this tincture were supplied to various hospitals and medical men, but hitherto we have not been able to obtain so many definite reports as we could have desired. The following remarks by Mr. W. A. Shann, M.B. (Cantab), of Lowestoft, are, however, of much interest, and we are indebted to this gentleman for his kindness in examining the nature of the tincture, and his courtesy in allowing us to publish his report. He states that he has a very strong impression "that the tincture of *Hyoscyamus muticus* is markedly superior to the ordinary tincture. In the first case in which I tried it—a case of inflammation of the bladder—the relief was immediate, and my subsequent experience has confirmed me in the opinion that it is a reliable preparation, of considerable therapeutic value. I have

found, too, that smaller doses were required than of the ordinary official tincture, and I now always prescribe it in preference to the ordinary tincture."

From the above information it would appear that a recognized galenical preparation of *Hyoscyamus muticus* is likely to prove of much value, and, although we do not anticipate that it is likely to supersede the official preparations of *Hyoscyamus niger*, we would suggest that a standardized tincture prepared by the method described above might with advantage be introduced into the next edition of the British Pharmacopœia, subject to the confirmation of its therapeutic value. The value of the drug as a source for the extraction of hyoscyamine is already recognized by some manufacturers, and a constant demand would doubtless promote a regular supply.

The following interesting remarks with regard to the growth of the plant in Egypt have been kindly supplied by Mr. Floyer, and we take this opportunity of thanking him for his kindness in supplying both material and information for this note :—

Hyoscyamus Muticus.

"This plant grows wild all over Egypt, where it is known by the name of 'Sakran,' 'the drunken.' In the rich soil of the Valley of the Nile the plant luxuriates, and one shrub weighs when fresh as much as 60 lb. Here it makes large succulent leaves, but does not give a very large amount of seeds. In light sandy soil the plant has less leaf and more flowers, and in coarse sand the root is very largely developed, the leaves become less and less and the seed vessels more and more numerous. A plant growing in coarse sand will sometimes ripen 5,000 seed pods. Though each pod may well contain 100 seed grains, the plant does not, in coarse sandy situations, cover any large area of ground. Under similar circumstances, any kind of erodium will fill whole valleys. But *H. muticus* always remains sporadic. It will, therefore, not be surprising to find that plant is difficult to grow. The seeds germinate, but an enormous percentage do not reach a height of three inches. The word 'hardy' is often applied to plants which can thrive under hard conditions. But the word is completely misleading. Such desert plants as mimosa, hyoscyamus, and many grasses, owe their power of resisting drought and of feeding themselves in poor soil to an extraordinarily delicate and complex organization for supplying themselves

with nourishment. And any attempt to plant them as a crop must take account of this. The plant does not bear submersion, and such as spring up in ground flooded by the High Nile are strictly annual. But those above reach of water attain an age of from three to five, or perhaps six, years, giving each year more seeds and fewer leaves. It has yet to be ascertained whether a five years' plant contains more alkaloid than a first year's plant. The Egyptians employ the plant as plasters for the chest."

Mr. GERRARD said when the drug under discussion was first introduced, he was surprised at the large amount of hyoscyamine Dr. Gadamer obtained from it, and had a suspicion the figures were too high, and the present authors' results confirm his suspicion. A specimen of the plant obtained from Kew Gardens, and examined by himself, gave about 0·6 per cent. of the alkaloid. One would naturally expect, as this plant gave such an abundant yield of active principle, that its price would be much reduced, but such had not been the case. On the therapeutic side of the paper, it might be remarked that therapeutists considered belladonna capable of giving all the effects of henbane. Mr. Gerrard said the sample of tincture shown was an elegant preparation of standard power, and he would have no hesitation, if henbane is to be retained in the Pharmacopœia, to recommend the *muticus* variety in place of the inelegant and nasty official variety.

Mr. BETTY asked if this tincture sometimes caused a dryness in the throat like the official tincture of hyoscyamus.

The PRESIDENT said Mr. Ransom had made this subject peculiarly his own.

Mr. RANSOM, replying, said he thought the estimations of Dunstan were likely to be more accurate than those of other investigators. He had no information regarding the dryness referred to by Mr. Betty, but none of the doctors to whom the tincture had been supplied had made any such complaint.

The thanks of the Conference were accorded to Mr. Ransom.

THE QUANTITATIVE SEPARATION OF STRYCHNINE FROM QUININE.

By E. F. Harrison and D. Gair.

The quantitative separation of a small amount of strychnine from a relatively large amount of quinine becomes necessary whenever it is required to make a full examination of such preparations as Easton's Syrup, or compound syrup of hypophosphites. Several methods of doing this have been mentioned by different chemists, but we have not found any of them to be satisfactory.

In 1883, in a paper on Easton's Syrup, read at the Conference, Davies and Schmidt described a method employed by them, consisting in colorimetric comparison of a solution of the alkaloids with solutions of known quantities of strychnine, after the addition to both of sulphuric acid and bichromate; they remark that "as a quantitative method it leaves much to be desired."

Wilson (*Pharm. Journ.* [3], **19**, 753) gives the result of examination of a number of samples of Easton's Syrup, including the determination of the strychnine, but does not describe the method used beyond saying that the alkaloids were dissolved in hydrochloric acid, and the strychnine precipitated by addition of potassium sulphocyanide, and weighed. We are unable to find any method of separation by means of sulphocyanide; a solution of 0·1 Gm. strychnine, and about 2 Gm. quinine hydrochloride was precipitated by potassium sulphocyanide, and the composition of precipitate and filtrate determined separately by the method finally adopted, which is described below; the results were:—

	Precipitate.	Filtrate.
Strychnine	0·0104 . . .	0·0826
Quinine (by difference) . .	1·2100 . . .	0·8262

A corresponding result was obtained when only enough sulphocyanide was added to precipitate a small part of the alkaloid.

It has been pointed out by Flückiger that potassium cyanide precipitates strychnine as alkaloid from solutions of its salts, and we experimented to see if this fact could be utilized. On adding potassium cyanide to a solution of salts of the two alkaloids, the strychnine is mostly thrown out before the quinine, but not sharply; by adding solution of cyanide two or three drops at a time, and extracting the liquid with chloroform, repeating this until appreciable traces of quinine were extracted, not more than

half the strychnine could be separated, and the method was abandoned.

In Allen's *Commercial Organic Analysis* (2nd edition) it is stated that a separation can be effected by precipitating the strychnine from a strongly acid solution by means of potassium ferrocyanide, and its amount determined by calculation from the quantity of ferrocyanide consumed; this is the method recommended by Holst and Beckurts for the determination of strychnine in presence of brucine. Our experiments with this process show that the precipitation is very slow, and if, as suggested, ferrocyanide solution is added until excess is shown by ferric chloride paper, the end-point is not at all well marked and definite. We also tried adding excess of ferrocyanide and titrating back with zinc chloride, using a uranium salt as indicator; this gave good results with strychnine alone, but in presence of quinine too much ferrocyanide was precipitated, and the results varied greatly according as the excess of ferrocyanide was more or less.

Another method given by Allen, originally due to Dwars, is to add ammonium oxalate to a neutralized solution of the alkaloids, allow to stand twenty-four hours, filter out, and wash the oxalate of quinine; regenerate the alkaloid from filtrate and washings, and treat it twice with 3 c.c. of washed ether, to remove amorphous alkaloid and the residual quinine, the strychnine being left. In addition to being slow, this method is much reduced in usefulness by the fact that the oxalates of the other cinchona alkaloids are comparatively easily soluble; so that if the quinine were replaced to any considerable extent by one of these other alkaloids in a sample of syrup, the results would be quite unreliable. In a trial of this method we took 0·05 Gm. of strychnine and 1·5 Gm. of quinine bisulphate, and obtained 0·0440 Gm. of alkaloid, representing the strychnine, or an error of 12 per cent. Various attempts to separate the two alkaloids by means of their different solubilities in ether, petroleum ether, and chloroform, were not sufficiently successful to be useful quantitatively.

The following method, depending on the different solubility of the tartrates in solution of Rochelle salt, proved quite successful. It is best to adhere closely to the details as to quantities, etc. An amount of total alkaloid containing about 0·05 to 0·1 Gm. of strychnine is dissolved in 60 c.c. of water slightly acidulated with sulphuric acid; ammonia is added as long as the precipitate re-dissolves, when the quinine will be in the state of acid sulphate; 15 Gm. of powdered sodium potassium tartrate is then added gradu-

ally, with stirring; then more ammonia, until the mixture is only just acid to litmus paper, and it is then warmed on the water bath for about fifteen minutes, and allowed to stand till quite cold (about two hours). The quinine tartrate is then filtered out with the aid of a pump, and washed with a solution of 15 Gm. sodium potassium tartrate in 45 c.c. of water, made just acid with sulphuric acid. The filtrate and washings are mixed, made strongly alkaline with ammonia, and extracted three or four times with chloroform; the chloroformic solution is washed with 10 c.c. of water, containing a few drops of ammonia solution, evaporated to about 4 or 5 c.c., 10 c.c. of alcohol added, and the mixture evaporated to dryness; the residual alkaloid is washed three times with 1 c.c. each time of washed ether, and the washings rejected; the residue is practically pure strychnine, and is dried and weighed. The alcohol is added not only to prevent decrepitation, but also to avoid retention of chloroform by the strychnine, which otherwise occurs. If the amount of strychnine in the total alkaloid taken is much over 0·1 Gm. it is necessary to increase the quantity of the first solution and of the Rochelle salt, otherwise the same treatment is employed.

A number of determinations in which known quantities of strychnine were taken were made by this method, and the results are given below. The bisulphate of quinine employed had been purified from all but traces of other alkaloids; the sulphate was ordinary good commercial salt, fulfilling the official requirements as to the amounts of other alkaloids present; the "mixed sulphates" was a mixture of equal weights of quinine sulphate and sulphates of the other alkaloids left when pure quinine was separated from the commercial article. The results show that the presence of these other alkaloids, even in considerable quantity, does not seriously affect the correctness of the results obtained by the method.

Taken.		Found.
Strychnine.	Other Alkaloidal Salt.	Strychnine.
0·0500	1·5 Quinine bisulphate	0·0510
0·1000	" " "	0·1000
0·1500	" " "	0·1504
0·2000	" " "	0·2036
0·0500	1·0 Quinine (alkaloid)	0·0504
0·0500	1·5 Quinine sulphate	0·0500
0·0500	" " "	0·0510
0·1200	2·0 " "	0·1194
0·0750	2·0 Mixed sulphates	0·0780

The PRESIDENT said this was the kind of paper the Conference desired to have, giving a certainty of results in pharmaceutical preparations.

Mr. F. C. J. BIRD said that when the list of Conference papers appeared he had been very pleased to notice that Messrs. Harrison and Gair were to attempt the solution of this analytical problem. Easton's Syrup was now being very generally examined throughout the country, but the divergence of the analytical results made it very evident that a reliable process was not being used. He had worked himself some time ago on the separation of those alkaloids by solvents such as petroleum ether, but the experiments had been so discouraging that they were not continued. There was no difficulty whatever in ensuring the exact proportion of strychnine in Easton's Syrup; you simply had to weigh up the alkaloid and dissolve it. Samples which he had every reason to believe were absolutely correct in strength had been returned on analysis as containing 20 per cent. too much strychnine down to 75 per cent. too little. The question which naturally arose was, what method of analysis was employed? A process had been recommended about a year ago which he believed was very extensively used. It had not been alluded to in Messrs. Harrison and Gair's paper, but it consisted in determining the amount of total alkaloid in the syrup, and also the amount of sulphate present. The equivalent quantity of alkaloid corresponding to the sulphate was then calculated, and the difference taken as strychnine. This was stated to be quite satisfactory, but, to his mind, it was a faulty method, and would not compare with the process given by the authors. On looking at the figures given in the paper, the greatest error appeared to amount to but 0·003 or 0·0036 Gm. on 0·075 and 0·200 Gm. of strychnine, which was quite small. He heartily congratulated the authors on having successfully worked out a satisfactory method of effecting a difficult analytical separation.

Mr. TYRER endorsed Mr. Bird's remarks. He had not gone quite so far as Mr. Bird in the determination of strychnine in complicated extracts; but it was correct to say that many of the methods employed were unsatisfactory. It had never occurred to him that the advantage of the solubility of tartrates was the way out of the difficulty, as had been shown by the authors of the paper. He should like to emphasize the value of having proofs of the papers read before members of the Conference, so that those who were interested in particular subjects might see beforehand

whether there was anything which they could contribute or confirm. He thought the new move worthy of commendation.

Mr. HARRISON said, in reply, that the method referred to by Mr. Bird of weighing the total alkaloid before and after sulphating was one in which error of working was much magnified. He wished to emphasize the necessity for adding alcohol to the residue, as otherwise the strychnine retained from 3 to 5 per cent. of chloroform, even after an hour's drying in the water oven.

NOTE ON THE VOLUMETRIC USE OF FEHLING'S SOLUTION.

BY E. F. HARRISON.

The volumetric determination of reducing sugars by means of Fehling's solution does not usually give more than approximate results, on account of the difficulty of sharply observing the end point of the reaction. The chief indicators that have been employed are potassium ferrocyanide and hydrobromic acid; both these, however, require the filtration of small quantities of the liquid before applying the test, which leaves much to be desired in respect of accuracy. In Pavy's modification the end-point is shown by the final disappearance of colour from the liquid, and the same may be attained by the use of potassium cyanide as suggested by Gerrard.

I have had occasion to employ Fehling's solution somewhat extensively in quantitative work, and have not found any of these methods quite satisfactory. It was suggested to me by one of the assistants engaged in the work, Mr. A. A. Kelly, that we might utilize the action of cupric salts in liberating iodine from iodide, and an indicator based on this action has proved a great improvement over those just mentioned. The indicator is prepared by boiling 0·05 Gm. of starch with a few c.c. of water, adding 10 Gm. of potassium iodide and diluting to 100 c.c. These quantities need not of course be exactly adhered to, but too much starch or too little iodide lessens the delicacy of the test; the solution should be prepared as required, and not used after it has been made more than two or three hours. In use about 0·5 or 1 c.c. of this solution is taken, acidified with about five or ten drops of acetic acid, and one drop or more of the titration liquid added; the latter need not be filtered. As long as unreduced copper is present, a colour is

produced, varying from red to blue, and of greater or less intensity, according as the end-point is far off or near. The production of no colour marks the end of the reaction.

This indicator gives a readily observed colour with one drop of a solution of copper sulphate of strength 1 in 20,000, and by its use titration of Fehling's solution with a suitable sugar solution can be made as accurate as most other volumetric operations. After very little practice one titration is sufficient for moderately accurate results, but greater exactness is of course obtained by repeating, and at once running in the sugar solution almost up to the required amount before testing.

Mr. TYRER said it was interesting to find that the processes adopted by independent workers for the purposes of their private or business work should so often coincide, and when he read the paper by Mr. Harrison he found that the method there referred to was in all essential respects like one that had been used for the last three or four years in his laboratories without any communication with Mr. Harrison. The process was worthy of all that had been claimed for it.

Mr. GERRARD said he meant to give this test a trial when he got back to his laboratory, and he hoped it would turn out as well as the author said it would, because, if so, it would be better than the test he (Mr. Gerrard) made. But both processes had something of a defect about them. It was a defect of his own process that it was necessary to prepare the potassium cyanide solution each time a test was made, and it would be an advantage if the solution could be kept ready for use. If Mr. Harrison's method was subject to the same defect he should be sorry. He should like to ask if Mr. Harrison had much experience of the urines which gave a very fine cloudy precipitate, because it was rather difficult to see when the end reaction takes place.

Mr. ALCOCK complimented Mr. Harrison particularly on his making the fact clear that weak solutions of starch are more effective in detecting iodine than the strong solutions generally used.

Mr. HARRISON said, in reply, that he thought an objection to Mr. Gerrard's cyanide method was the liability to atmospheric oxidation when the copper was in solution. The difficulty in the case of non-coagulation of the cuprous oxide did not occur with the proposed indicator, suspended oxide not at all interfering with the production of the colour.

The thanks of the Conference were accorded to Mr. Harrison.

A COMPARISON OF DIETERICH'S PROCESS FOR THE DETERMINATION OF MORPHINE IN OPIUM WITH THAT OF THE BRITISH PHARMACOPŒIA.

BY HAROLD E. MATTHEWS.

In *Helfenberger Annalen* for 1896, E. Dieterich publishes a process for the determination of morphine in opium, which consists essentially in removing the bulk of the narcotine present in a water solution by quick precipitation with a limited quantity of ammonia and subsequent precipitation of the morphine by excess of ammonia in presence of ethyl acetate. An examination of the process was made with a view to a comparison with the process official in the British Pharmacopœia of 1898.

The details of Dieterich's process are as follows: Triturate 6 Gm. of opium in fine powder with 6 Gm. of water, dilute, wash out into a weighed flask and make up to 54 Gm. with water. Let the whole digest for 15 minutes, shaking frequently, and then filter through a folded filter 10 cm. in diameter. Take 42 Gm. of the filtrate, mix with 2 Gm. dilute ammonia [1] (1·7 per cent. NH_3) by rotation, not shaking, and filter through a neatly-folded filter 10 cm. in diameter. Mix 36 Gm. of the filtrate in an accurately-weighed flask with 10 Gm. of ethyl acetate by rotation, add 4 Gm. of dilute ammonia, close the flask and *shake* well for 10 minutes.

In order to separate the resulting emulsion add immediately 10 Gm. of ethyl acetate, and carefully pour off the ethereal layer as completely as possible. Again add 10 Gm. of ethyl acetate and repeat the decantation. Pour the remaining liquid in the flask (leaving behind the crystals adhering to the flask) through a filter 8 cm. in diameter, and wash out the flask and filter twice with 5 c.c. of water saturated with ethyl acetate. When the flask has well drained and the filter is dry (dry at 100° C.) remove the crystals on the filter to the flask by means of a camel's-hair brush. Set the flask to dry immediately, and dry till the weight is constant.

It will be seen that the morphine weighed is intended to represent 39/11 Gm. of opium (36/44 of 42/54 of 6), but the successive quantities of the morphine containing liquors which are weighed off are obviously more concentrated as regards morphine content than are the bulks of which they are a fraction.

It may be asked if digestion in water for 15 minutes is sufficient to extract the morphine from finely-powdered opium. It

[1] A mixture of 17 Gm. liquid ammonium, PhG., and 83 Gm. water.

was found that the figure obtained on digesting for a longer period was practically the same as that from a digestion of the specified duration.

The precipitation of narcotine previous to precipitation of morphine is attended with the possibility of loss of morphine in the case of an opium containing but little narcotine.

The process is easily carried out, and is very expeditious, the whole of the operations up to the point of drying the morphine crystals, occupying about an hour. It should be noted that a temperature of 100° C. is mentioned as sufficient for drying the morphine crystals, whereas every one knows that a slightly higher temperature, viz. 110° C. (B.P.) (or, according to W. Göhlich, 120° C.)[1], is necessary to render morphine anhydrous and to get concordant results.

To make a comparison several analyses of the same sample of good Turkey opium were made by both Dieterich's process and that of the British Pharmacopœia. But in both cases the morphine was dried at 110° C. and subsequently titrated as in the B.P. process. The results are given in the following table:—

Total Yield of Morphine.	Pure Morphine by Titration.	Per cent. Purity of the Morphine.	Percentage pure Anhydrous Morphine.
Dieterich 1. 0·5921	0·5875	99·23	15·39
„ 2. 0·5964	0·5913	99·14	15·49
„ 3. 0·5954	0·5948	99·9	15·58
Average. 0·5946	0·5912	99·42	15·49
B.P. . . 5. 1·5720	1·5680	99·76	15·68
„ . . 6. 1·5633	1·5550	99·47	15·55
Average...1·5676	1·5615	99·61	15·61

Dieterich's process involves less waste of opium than the British Pharmacopœia process. It has the further advantage of being much more expeditious. But it is not quite as exact as the B.P. process, giving a morphine which is less pure and a smaller total morphine yield.

In the preceding table it should be noted that there is a wide discrepancy between titration No. 3 and the two previous ones. Indeed, if this be neglected, and the mean of the two previous determinations taken, the superiority of the B.P. process as regards accuracy appears to be even greater.

[1] *Arch. Pharm.*, 1895, **233**, 631–45.

To the buyer of opium this process of Dieterich's appears to me to be a valuable one when slightly modified, on account of the rapidity with which a determination can be made, the results obtained being sufficiently accurate for commercial purposes. But the pharmacopœial process is certainly the better for the exact standardization of galenical preparations of this most important drug.

There was no discussion on this paper, but the PRESIDENT thanked Mr. Matthews for bringing it before the Conference.

PROPOSED NEW METHOD OF STANDARDIZING FERRI ARSENAS, B.P.

WM. W. S. NICHOLLS, B.SC. (LOND.), F.C.S.

When your Conference suggested that the arsenic content should be substituted for the ferrous arsenate content as the standard test for this substance, it appeared to me that they were acting in the best interests of the trade; although proposing what at first sight might appear to be a difficult and tiresome assay for one rapidly and easily performed as well by the pharmacist behind his dispensing screen as by the analyst in his laboratory.

It was with the view of making the estimation of the arsenic in Ferri Arsenas as easy a task as that of assaying the iron (ferrous) that I undertook the examination of typical commercial samples of the salt; and the method I shall introduce to you will, I venture to think, fully meet your expectations and fulfil your requirements.

It is no new method. I claim no credit as its originator; but, so far as I can learn, it has found no place in the pharmaceutical laboratory, and does not appear to have received the attention its simplicity and accuracy merits.

As long ago as 1867, Clark and Esilman deposited at the Patent Office a provisional specification "for decomposing sulphides of copper," in which it was pointed out for the first time that the "per"-salts of iron decomposed the sulphides of a large number of metals; and it occurred to them that this action might be used for the estimation of arsenic when in the form of its sulphide. Further, they found the method applicable to the direct estimation of arsenic in iron. Here, then, is my proposition. Adopt this method for standardizing your Ferri Arsenas.

I will not trouble you with details of the process further than is necessary to explain how it was applied in my experiments and to assure you of its absolute accuracy. You will gather more from a perusal of the articles in the *Journal of the Society of Chemical Industry*, **10**, 1891, 444 et seq., and in the *Journal of the Chemical Society* (Trans.), **61**, 1892, 424 et seq., than I can possibly explain by word of mouth, and will learn how wide and varied is its application. At the same time, however, I shall point out that for the analysis of "Ferri Arsenas" no preliminary treatment is required; you have simply to put a weighed quantity of the salt into a distilling flask, add a solution of $FeCl_3$ in strong HCl, connect up with a condenser, and distil over the $AsCl_3$. There is, in our case, no SH_2 to be taken into account, as none exists; we have no sulphur in our original salt, and we add nothing to generate aught but the pure $AsCl_3$, and, as I shall presently show, the necessity for converting the $AsCl_3$ into As_2S_3 may also be dispensed with.

The apparatus required is of the simplest description. A stoppered 4 oz. glass retort with the neck bent into the shape of an inverted V (Λ) connected with a worm condenser, to the other end of which is attached a straight adapter. This passes into about 75 c c. of water in a flask fitted with a guard tube and immersed in ice-cold water. A small Bunsen lamp and a piece of asbestos gauze completes this part of the outfit. One other piece of apparatus—viz. a burette—and we are in a position to commence our experiments.

The solutions required are—

1. Pure re-distilled arsenic free HCl.
2. 4 oz. of perchloride of iron, dissolved in 100 c.c. of the acid.
3. Iodine of half the strength of the volumetric solution of iodine of the B.P.—i.e. of N/20 strength, each c.c. of which is equivalent to 0·001875 Gm. As, and which has been standardized against pure As_2O_3.
4. Caustic soda (free from iron) as strong as possible.
5. Sodium bicarbonate (saturated).
6. Starch paste.

For the experiment, weigh out accurately 0·13 Gm. of the sample of Ferri Arsenas and introduce it into the retort, together with 1 Gm. of ferri sulphas, B.P. (powdered), 10 c.c. of the solution of $FeCl_3$, and 20 c.c. of the concentrated HCl. Insert into the hole of the retort which usually carries the stopper a cork, through which passes a thistle funnel, bent so that the straight end dips well under the liquid in the retort and the thistle end sits upright, con-

nect with the condenser and receiver, protect the bottom of the retort with the asbestos gauze, and apply a very small flame. The contents of the retort must be kept in motion until the liquid begins to boil, otherwise superheating occurs, accompanied by violent bumping and consequent danger to the apparatus. As soon, however, as boiling commences the contents distil without further attention until, by careful regulation of the flame towards the end of the distillation, only about 10 c.c. of liquid remains in the retort. Some experience is needed to prevent disaster at this point. Should "bumping" commence, the flame must be immediately removed and the retort slightly raised from the hot gauze, as if any of the iron solution be carried over into the distillate the experiment is valueless, for on making the solution alkaline, prior to titration, you will simply regenerate your Ferri Arsenas.

The first distillation should be made, as I have already explained, at as low a temperature as possible, but the second and third may be carried on more rapidly. For the second distillation add through the thistle funnel in the retort 20 c.c. of concentrated HCl and proceed as before.

Two distillations are sufficient to effect the liberation of the whole of the arsenic, but, as a precaution, I have invariably made a third with a further 15 c.c. HCl, and a final one with 20 c.c. H_2O.

The condenser should be washed with water until the runnings cease to redden blue litmus paper, the washings being added to the distillate. The distillate is then exactly neutralized with a strong solution of NaOH (free from Fe), or of AmHO, an excess (50 c.c.) of a saturated solution of $NaHCO_3$ and a few drops of starch-paste added, and the titration with N/20 iodine carried out as directed in the text-books.

A few words as to the materials employed. Concentrated HCl and solid $FeCl_3$ invariably contain arsenic, the $FeCl_3$ in considerable quantity. Care must therefore be taken in every instance to test by a blank experiment, or, better still, to free the materials from arsenic by a method which I hope to describe in a subsequent paper. The distillate should be made up to equal bulk with that from an actual experiment, so as to correct also the amount of iodine needed to produce the permanent blue colour indicating the completion of the titration.

A note of warning as to the use of an efficient condenser is necessary, for the success of the experiment depends entirely on the collection of the whole of the volatile $AsCl_3$. The piece of apparatus I can confidently recommend is that figured as No.

2249 in Messrs. Griffin's catalogue. It is compact, and by far the most powerful condenser on the market.

The annexed table of results will show you the proximate analysis of some twenty-eight samples of Ferri Arsenas obtained from representative wholesalers in the three kingdoms. A glance at the figures reveals broadly these facts:—

1. That there are on the market two principal kinds of Ferri Arsenas—the one containing approximately 30 per cent., the other 27 per cent., of arsenic.

2. That no less than 39 per cent. of the samples examined fell below the B.P. standard for ferrous arsenate.

The suggestion of the Conference that this standard be abolished in favour of the arsenic content is, therefore, fully justified. The figures for the percentage of arsenic, on the other hand, are so uniform throughout the series of samples as to leave little doubt of the suitability of the standard proposed and its absolute fairness as compared with that at present in use.

A word, however, must be said as to this 10 per cent. ferrous arsenate standard. That there is a difficulty in producing a satisfactory preparation as regards the ferrous iron content cannot be denied, but that the percentages should in so many cases fall from a possible 30 to below the standard 10 is a matter for the manufacturers' careful consideration.

However, my work is not so much to point out defects as to urge the adoption of the new standard proposed by the Conference.

I hope that the method suggested for the estimation of the arsenic content of the salt may commend itself to you, and that it may find a place in the next edition of the B.P. Its accuracy is well known to those analysts who work with iron and steel, and in the large number of experiments—over one hundred in all—which have been made by myself and my colleagues on Ferri Arsenas it has proved equally reliable. In no single instance did our results vary by more than three-tenths of 1 per cent. It is easy of application, requires no expensive apparatus, and can be carried out equally well in the shop as in the laboratory.

In a subsequent paper I propose to introduce to your notice an equally elegant and rapid method of determining the iron content, as well as to give you particulars of the means adopted to ascertain the percentage of moisture. In fact, the salt affords so many interesting points in its analysis, and in the calculations for the distribution of its ingredients, that I intend to cite it as an excellent example on which some of our young friends at Bloomsbury

Square may exercise their ingenuity during the coming season.

Incidentally, I have examined a few samples of Sodii Arsenas, B.P., and the distillation method of assay for percentage of arsenic is equally applicable to this salt. Table No. 2. shows my results.

It remains for me to thank most cordially those manufacturers who so kindly supplied me with the samples—all save No. 20—of genuine Ferri Arsenas, and especially those who have permitted their chemists to undertake assays on my behalf and have prepared special specimens for my examination; your Finance Committee for the grant made to defray part of the cost of investigation; and my colleagues, Messrs. Cutbush and Robinson, to whom I am indebted for valuable practical help.

TABLE No. 1. PROXIMATE ANALYSIS OF "FERRI ARSENAS," B.P., 1898.

Progressive No. of Sample.	Percentage of				Equivalent Percentage of			Total per Cent.
	Iron.		Arsenic.	Water.	Ferrous Arsenate.	Arsenate Ferric.	Oxide Ferric.	
	Ferrous	Total						
1	4·68	27·73	29·55	15·56	12·43	65·91	5·93	99·83
2	5·91	28·15	29·94	14·66	15·78	63·84	5·59	99·87
3	4·86	28·30	29·92	14·23	12·91	66·47	6·26	99·87
4	3·68	28·20	29·81	14·29	9·83	68·87	6·28	99·81
5	3·63	28·42	29·73	14·18	10·76	67·84	7·02	99·80
6	3·49	28·01	29·82	14·53	9·28	69·38	6·60	99·79
7	3·51	28·41	30·15	13·64	9·34	70·19	6·81	99·98
8	5·79	28·19	30·61	13·46	15·38	66·08	4·98	99·85
9	3·87	27·84	30·85	13·31	10·28	71·17	5·08	99·84
10	3·49	28·12	30·72	12·89	9·27	71·74	5·80	99·81
11	12·36	30·20	27·04	17·01	32·84	41·54	8·47	99·86
12	9·58	28·25	30·66	13·88	25·46	57·42	3·15	99·91
13	2·17	29·88	27·07	15·94	5·78	65·30	12·83	99·85
14	5·08	28·23	29·94	14·31	13·50	65·99	6·04	99·84
15	2·74	28·06	29·87	14·36	7·29	71·25	7·00	99·90
16	5·19	30·48	26·89	15·86	13·78	57·82	12·38	99·84
17	5·07	30·04	27·10	16·06	13·47	58·65	11·64	99·82
18	3·58	28·17	29·21	15·61	9·51	67·58	7·15	99·85
19	5·04	30·42	27·08	15·54	13·41	58·66	12·21	99·82
20	3·39	32·02	25·39	15·59	9·01	58·10	17·10	99·80
21	4·23	27·76	29·55	15·48	11·24	66·98	6·17	99·87
22	3·07	27·82	29·64	15·11	8·16	69·90	6·67	99·84
23	7·37	30·59	27·02	14·74	19·58	53·10	12·43	99·86
24	3·20	30·24	27·06	15·58	8·52	62·87	12·86	99·79
25	5·29	27·78	30·19	14·63	14·06	66·15	5·02	99·86
26	5·04	30·27	27·01	15·85	13·45	58·48	12·08	99·81
27	9·10	31·40	27·25	14·49	24·18	49·66	11·51	99·84
28	3·63	27·85	29·16	15·83	9·65	67·34	7·00	99·82

TABLE NO. 2. ARSENIC CONTENT OF SODII ARSENAS, B.P., 1898.

Progressive No. of Sample.	Percentage of Arsenic. By Calculation.	Percentage of Arsenic. By Analysis.	Percentage of Water. By Calculation.	Percentage of Water. By Analysis.
1	40·30	40·31	Nil.	Nil.
2		40·28		Nil.
3		40·22		0·81
4		40·32		Nil.
5		40·18		0·63
6		40·30		Nil.

Mr. NICHOLLS, while communicating this paper, referred to some diagrams on the walls which were used by Professor Young the previous day, and, pointing to a diagram of a condenser, advised those present not to use a condenser such as that shown by Professor Young if they wished to get good results.

Mr. O. C. M. DAVIS (Bristol) protested very strongly against the remarks made by Mr. Nicholls in regard to Professor Young's paper the previous day. Those who heard the paper would agree that it was one of the best papers that had been placed before the Conference, and he considered it was very much out of place for Mr. Nicholls to go out of his way to pass remarks about that paper. If he had wished to criticize Professor Young, he should have been present when he gave the demonstration, and if he had been present Mr. Nicholls would have known that the diagram to which he had taken exception was not mentioned by Professor Young. As one of Professor Young's old students, he felt that he could not allow Mr. Nicholls' remarks to pass without comment.

Mr. TYRER said he was pleased to see that the spirit that was shown by students in the days of Hoffmann—namely, loyalty to the "master"—was still alive. He had no doubt that Mr. Nicholls had been carried away by enthusiasm for his subject otherwise he would not have made the remarks to which exception had been taken. Mr. Nicholls had laid great stress on accuracy in the determination of such substances as arsenic, and the very simple and ordinary condenser to which he had referred in

connection with his own paper, and of which he had given a sketch on the board, was, at any rate, one of those which were in very common use. In a busy laboratory one could not afford to have a long condenser, and the condenser to which Mr. Nicholls referred in his haste was not one of those to which Dr. Young made the slightest reference. He agreed with Mr. Nicholls' statements, to the effect that manufacturers should not be so careless as to have such wide differences as he had indicated. The tables clearly showed that the variation was due to oxidation from exposure. There was no fraud, for what was not in the ferrous condition was in the ferric. As a manufacturer, he might say that since the arsenic scare the old tests had not been got rid of. In regard to Marsh's test, what they had done was to regulate and synchronize so as to make it capable of determining with some degree of certainty whether arsenic was present or not. It used to be thought that if a substance contained no more than 1 part of arsenic in 100,000 no harm could be done; now, articles containing 1 part in 1,000,000 caused surprise. It was, however, perfectly true that there were at present on the market ferric chloride and other drugs sold at commercial prices which did not contain one part of arsenic in four million parts.

Mr. Alcock said that with reference to the author's remarks concerning the use of barium chloride as a possible test for the quantitative determination of such soluble arsenates as that of sodium, it was true that such a suggestion had been made, and it would be found that the precipitate obtained was a very interesting compound. The subject brought forward by the author was not new to the Conference, for Mr. Dudderidge had suggested that the determination of the sodium would be a measure of the arsenic content, and apparently the B.P. admitted such a conclusion as far as ferrous arsenate is concerned, but objection was always rightly raised against these methods. The process now described was not new, and had been used by the toxicologist for some years with quantitative success. Its great objection was the bumping which terrified the student; but if the process was introduced into the B.P. it would only fall into the hands of expert pharmacists and safe working was ensured. The arsenical hydrochloric acid question had been much to the fore since the beer scare, and now the difficulty as to arsenic in it and other chlorides had been reduced almost to complete elimination, and could no doubt be relied upon at the present moment by the pharmacist as well as the analyst.

Mr. HARRISON pointed out that Mr. Nicholls had not given any control figures, and until they had those control figures he was afraid they could not take his figures as proved.

Mr. NICHOLLS, in replying, wished to apologize, and withdrew the remarks he made concerning the diagram shown by Professor Young. As Mr. Tyrer had said, he was carried away with the enthusiasm of his subject. In regard to hydrochloric acid, he had examined thirteen samples supposed to be free, but not one of them was arsenic-free. Mr. Harrison had referred to control figures. Personally, he did not attach much importance to them, because it was possible to find anything if it were known to be there. They did make some control tests, however, and the arsenic came out quantitatively.

Mr. HARRISON asked what method Mr. Nicholls used in determining arsenic in hydrochloric acid.

Mr. NICHOLLS said that the tests were done electrolytically.

The author was thanked for his paper.

A CONCURRENT CURRICULUM.

BY H. WIPPELL GADD, F.C.S.

One of the objections very generally entertained to the Pharmacy Bill, now before the House of Commons, is due to the clause which, somewhat irrelevantly, seeks to give to the Pharmaceutical Society power by bye-laws to enforce a curriculum upon those who intend to present themselves for the qualifying examination. With the present scarcity of apprentices, and the many drawbacks which in these days militate against the popularity of pharmacy as a calling, it is contended, with much reason, that it would be absurd to insist on anything like a collegiate course for those whose careers will probably be almost entirely commercial. On the other hand, educationalists agree that examination is but the roughest test of efficiency, and that a proper standard can only be attained by a suitable course of training. Moreover, the great majority of students voluntarily submit themselves to some sort of curriculum, although, unfortunately, most of them take their training as they sell their drugs, in a compressed form. But training to be thorough must be prolonged. Concentrated education is as delusive as concentrated food.

It is rightly stipulated that all students shall undergo a three years' apprenticeship or its equivalent. It would be too much to add to this a nine months' curriculum, although the subjects, a knowledge of which is demanded, require a full academic year for their proper teaching. The alternative would seem to be to take the two courses concurrently. Let the curriculum, voluntary or compulsory, be spread over the period of apprenticeship, so that theoretical knowledge may be illustrated by practical experience, and routine work explained by a study of scientific causes.

It may be said that this is done already, as apprentices attend the evening science classes held in every large provincial town. But these are too often followed in a very desultory fashion, the applicability of the sciences to pharmacy not being indicated by the teachers, nor readily appreciated by the students. Moreover, the modern youth objects not unnaturally to give two three or hours to close study after spending nine or ten in commercial pursuits; nor is it desirable for health's sake that, having inhaled the aroma of asafetida, valerian, and the like during the day, he should spend the evening in an atmosphere heavy with sulphuretted hydrogen.

The exigencies of modern commerce prevent most masters from imparting much theoretical knowledge to their pupils, and apprenticeship should not, therefore, now to be looked upon as full-time employment. If a curriculum is to be followed during apprenticeship, a certain amount of leisure must be allowed, and an ideal course, with the necessary private study, would absorb practically half the student's working time. Throughout the country there are now established university and other colleges, technical schools, and the like, and many of these have already arranged pharmaceutical courses, whilst others, no doubt, would do so if a demand arose.

A typical course would be somewhat as follows :—

THREE YEARS' COURSE.

First Year :—

Chemistry	2 hours per week.
Practical Chemistry	3 hours per week.
Materia Medica	2 hours per week.
Pharmacy	2 hours per week.
Physics	1 hour per week.
Total	10

Second Year :—

Chemistry	2 hours per week.
Practical Chemistry	3 hours per week.
Botany	1 hour per week.
Practical Botany	2 hours per week.
Materia Medica	1 hour per week.
Pharmacy	1 hour per week.
Total	10

Third Year :—

Chemistry	2 hours per week.
Practical Chemistry	3 hours per week.
Botany	1 hour per week.
Practical Botany	2 hours per week.
Materia Medica	1 hour per week.
Pharmacy	1 hour per week.
Total	10

Such a course can be taken at the University College, Bristol; the Municipal Technical College, Bradford; the Municipal Technical College, Derby; the Royal Albert Memorial College, Exeter; the University College, Nottingham; the University College, Reading; the University College, Sheffield; and Owens College, Manchester; and doubtless could be arranged at many other public and private colleges and schools. The arrangements for the classes of course differ locally; but in most places they can be taken either in the day or evening, as best suits the student's convenience. The expense of such a curriculum would not be greater than a full-time course taken subsequent to apprenticeship.

Mr. NEWSHOLME pointed out that a similar curriculum to that mentioned by Mr. Gadd had already been laid down at Nottingham and Sheffield.

Mr. GADD said the curriculums in force at Nottingham and Sheffield were recognized in the paper, but owing to the late hour he had omitted reference to them.

Mr. Gadd was thanked by the President for his paper.

The PRESIDENT then announced that the following four papers would be taken as read, and he hoped they would

be read and afterwards discussed in the pharmaceutical press.

AGRICULTURAL AND HORTICULTURAL POISONS.

By E. M. Holmes, F.L.S.

I have noticed on various occasions expressions of opinion in the pharmaceutical press that the proceedings of the British Pharmaceutical Conference would prove more attractive to a large number who do not usually attend its meetings if some of the papers read had a bearing upon important commercial or parliamentary subjects which might either be discussed at the meetings, or subsequently in the pharmaceutical press. Within certain limits, I think the idea is a good one, and I feel that no apology will be required from me—as one who has for many years taken an especial interest in horticulture, and more recently in entomology—for offering a few observations on the subject of agricultural and horticultural poisons, with especial reference to certain recent widely published and unjustifiable misrepresentations which have appeared in the public press.

The importance attached to the scientific study of agriculture and horticulture during recent years has naturally increased the demand for insecticides and fungicides, for destroying animal and vegetable pests. Some of the chemicals used for these purposes, such as potassium sulphide, Bordeaux mixture, lime and copper and ammoniated copper preparations, carbon bisulphide, white hellebore, tobacco paper, kerosene emulsion, sulphur, ferrous sulphate, preparations of tar, quassia powder, and similar substances do not come under the category of statutory poisons, and can be sold without restriction by any one. A few, such as corrosive sublimate, Paris green, white arsenic and its preparations, and potassium and sodium cyanides, come within the scope of the Pharmacy Act, 1868, and although these can be sold by wholesale to retail dealers if duly labelled with the seller's name and the word "poison," such substances cannot, as you are aware, be sold by retail except by registered chemists—the persons specially trained to handle them—and then only subject to the strict regulations prescribed by the Act.

Unfortunately, on account of ignorance, or for less excusable reasons, these facts have been misrepresented by a portion of the public press, and even before an official committee appointed by a department of the State. It has been persistently stated that

chemists want a "monopoly" of the sale of poisons, in order to make huge profits by such sale, whereas the real facts of the case are that the Pharmaceutical Society is bound by Act of Parliament to see that the disposal of a small number of "scheduled" poisons is restricted to those who have been educated as to the nature and properties of poisons, and fully comprehend the necessary precautions to be taken in using them. This is a public duty, imposed in the public interest, upon the Pharmaceutical Society, and is no more a monopoly than is the practice of medicine. Moreover, it is the duty of the Society's Registrar to prosecute individuals transgressing the law, whenever satisfactory information of a contravention is brought to his notice. Such action may be a distasteful thing to offenders, but ought to be a satisfaction to the nation at large. The annual prosecutions for the illegal sale of poison involve the society (see Privy Council Poisons Committee Report) in an annual loss of about £700, so that this so-called "monopoly" does not appear to be of a highly remunerative character to the prosecuting body. Chemists, too—far from finding the sale of poisons a source of profit—are often compelled to forego sales, through exercising the care and discrimination required by the Statute; and they often feel impelled, on public grounds, to refuse the profit that would accrue from an indiscriminate distribution of the potent articles within the Poisons Schedule.

In cases where there is no evidence that the poison asked for is to be put to a legitimate use, or where there is a suspicion of criminal intention, it is the duty of the chemist to refuse, and he does refuse, to sell, although he may lose a customer thereby. Any appreciable profit that may be made out of the sale of poison falls rather to the lot of the wholesale manufacturer. As an instance, I may refer to an extremely dangerous and inelegant preparation known as the Ballikinrain Ant-destroyer, a half-pint bottle of which contains enough arsenic, in solution or temporarily suspended, to kill 200 people. The contents of such a bottle are said to cost the maker *7d.*, and it is retailed at *3s. 6d.* It is remarkable that the misrepresentation of the position and aims of chemists should be made by the agents of the makers of this and similar preparations, and it is somewhat anomalous that a member of the firm which makes the Ballikinrain Ant-destroyer should also be a member of a Government Committee appointed to make inquiries into the alleged necessity for relaxing the provisions of the Pharmacy Act! If the simple opportunity had been afforded the Pharmaceutical Society of challenging the composition of the

Select Committee, even as a prisoner at the bar has the opportunity of challenging a jury about to be empanelled, it is not improbable that one at least of the Committee would have been excluded on the plea that he was an interested person.

It may here be pointed out that there is no imperative necessity for the use of arsenic or any other scheduled poison for killing ants and other insects, since there are in the market, easily obtainable and equally efficacious, several non-poisonous preparations for the same purpose. Indeed, it should be distinctly understood by those engaged in agriculture and horticulture that there is no difficulty whatever in obtaining safe and effectual insecticides and fungicides through any tradesman; also that it is only those few poisons which are usually selected by criminal poisoners, and those which have been most frequently used by intending suicides, that are, by Act of Parliament, purposely rendered difficult to obtain. To repeal that Act would be absurd, since the reason for its enactment was to restrict the retail sale to the public of such poisons as much as possible.

Another misstatement which has been industriously circulated through the press, by interested manufacturers, is that chemists are unable to give advice concerning the use of agricultural and horticultural preparations. But this statement will not bear investigation. In fact, the very men who have done the most to provide useful insecticides and fungicides, to make improvements in those previously used, and to publish freely such improvements, reserving only for their own profit the results of discoveries made by themselves, have been chiefly chemists and druggists. This assertion can be verified by reference to the columns of the *Pharmaceutical Journal*, or to the advertisement pages of periodicals specially catering for agricultural and horticultural requirements. In my judgment, chemists are not only acquainted with the requirements of agriculture, but are more competent than ordinary tradesmen to give reliable advice as to the remedies to apply in any given case. Registered chemists have to undergo a stringent examination in botany and chemistry, amongst other subjects, an ordeal through which no ordinary tradesman is compelled to pass, and as the proper uses and doses of antidotes for poisonous substances are included in the technical education of all pharmacists, there can be no serious question as to their special competence to advise and caution the public on these matters. It is also quite beyond dispute that no one class of the community has devoted more time and applied its scientific knowledge to perfecting pro-

cesses and improving well-known preparations than the chemist, and no one has more freely published the results of his scientific work on the subject. It gives me much pleasure to specially acknowledge the value of the contributions of Mr. G. F. Strawson, whose recent paper on "Standard Fungicides and Insecticides in Agriculture" has received the approval of many influential members of the Royal Agricultural Society.

I may add that it would naturally be the desire, as well as to the interest, of the chemist to sell, whenever possible, non-poisonous preparations instead of those prepared with statutory or scheduled poisons. Judging from inquiries made recently at the Royal Agricultural Show at Park Royal, it would appear that the majority of wholesale dealers—such as the large florists and dealers in agricultural preparations—prefer to sell non-poisonous articles. But the conservatism of the untravelled British farmer and of the homely shepherd keeps up some demand for the more poisonous articles, as giving less trouble, whilst the risk is ignored. It is only this circumstance that prevents to a great extent the use of newer and safer remedies, since harmless preparations not containing scheduled poisons are readily obtainable, and are constantly advertised in agricultural and horticultural journals.

The danger of using poisons like arsenic and Paris green (copper aceto-arsenite) lies, of course, in their insolubility in water, and the probability that when the fluid in which they are dissolved or suspended is evaporated, or is washed away by rain, the insoluble powder may adhere to foliage upon which cattle or horses browse; or, falling upon grass below fruit trees over which the poison has been sprayed, may be eaten unwittingly by valuable dogs, or by fowls, or geese, or animals browsing upon the grass. Two instances have recently been related to me of serious loss resulting from the use of horticultural preparations containing arsenic. In the one case, two valuable cows were lost after innocently feeding upon the grass bordering a path which had been sprinkled with weed-killer; and in the other case, about a hundred and fifty fowls were destroyed through pecking grain or small stones which had inadvertently become splashed with arsenical weed-killing solution. Tasteless poisons, like arsenic, are much less likely to be noticed by animals than acrid powders such as white hellebore, or strong smelling preparations like those of tar, petroleum, or naphthalene. I consider, therefore, that pharmacists, as the legal guardians of the public safety, so far as

the sale of poisons is concerned, should aid the Government in endeavouring to reduce the death-rate resulting from the accidental or intentional use of dangerous poisons—(1) By strongly opposing any attempt to extend the sale of scheduled poisons to persons not fitted by the necessary education to safeguard their uses; and (2) by endeavouring to discover substances which are non-poisonous to human beings, and yet will effectually replace white arsenic, nicotine, and potassium cyanide, or their preparations at present in use.

The plants that are used in other countries as insecticides and insectifuges have not as yet by any means been fully exploited, nor have the number of chemical substances obnoxious to insects and fungi been fully investigated. Thus, the tea-seed cake used by the Chinese as a vermifuge on lawns, and the "tuba" root used in the Straits Settlements as an insecticide, have scarcely been tried in this country, while the value of acrid substances such as cayenne pepper, euphorbium, and lobelia, have not been turned to account. Mustard is sometimes used to rid flower-pots of worms, but a full use has not been made of many powerfully odorous but harmless substances which are objectionable to insects. Recent careful experiments have shown that tannin, oxalic acid, and other chemical substances found in plants protect them from the attacks of slugs and snails; and ordinary observation shows that some plants, such as elder, *Euphorbia*, *Campanula*, etc., are hardly ever attacked by caterpillars. The constituents of such plants are deserving of experiment as insecticides, and in organic chemistry there is work in the synthesis of such bodies as the active principle of *Pyrethrum cinerariæfolium*, the only bar to the use of which is its expense. The chemical nature of the poisons employed by spiders and other insects in killing their prey is also worthy of investigation, while further research is necessary with regard to the study of wild plants that carry diseases to those under cultivation. Thus, it is well known that *Dulcamara* and other Solanaceous weeds in hedges may carry the potato disease on from year to year in cultivated ground, and that the barberry in hedges carries one form of the disease that attacks wheat, and will communicate it to the crop. Dr. Plowright's researches have shown many instances of this habit in fungi, of living part of their life on one plant and part on another.

The same kind of research is also needed concerning the habits of insects. Thus, it is well known that the bark of the plum

tree, so often planted (because tithe-free) in Kentish hedges serves as the home of the winter-stage of the hop aphis when the hops are cut down. It is also well known that oily or fatty preparations, if applied to insects so as to cover their spiracles or breathing pores, rapidly kill them by simple asphyxiation, and that, if oil be combined with a strong smelling preparation like that of peat wood or coal tar, it will prevent the insects in the imago or fly stage from depositing their eggs on animals. When the life-story of an animal is known, we find there are always some periods in its existence at which it can be more easily prevented from propagating its species, and such knowledge can profitably be turned to account. It has been shown by a lady who read a paper at a recent meeting of the Linnean Society that even the minute scale insects which are so difficult to destroy have a natural enemy in the form of an internal parasite that reduces their numbers. Sufficient attention has not been paid to the insect friends of the gardener and farmer, such as the lady-bird larva, the lace-wing fly, ichneumon flies, and varied sylphid flies and Hymenoptera. In view of the disturbance of the balance of Nature, owing to the destruction of many useful birds, it seems highly probable that in the future some of the more minute insect friends of man will have to be specially cultivated for use on farms and in gardens. An instance of the evil of interference with natural laws has been shown by the introduction of the mongoose into the West Indies resulting in the increase of ticks and other insects to an enormous extent, so as to prove a serious injury to domestic animals. The mongoose, which was introduced to destroy the rat, gave the preference to fowls, and to the native lizard that feeds on and keeps down the ticks and other insects, with the result that the West India Department of Agriculture is already recognizing the necessity for protecting such birds and animals as destroy insects injurious to agriculture and horticulture. Many pharmacists possess a love of natural history, and I venture to suggest that, if they exercise their hobby in this practical direction, they will find it possible to combine business with pleasure. Or, if they prefer to keep the two quite distinct, those pharmacists who use their scientific acquirements to improve the position of agriculture, may at least have the satisfaction of feeling that their native country is all the better for their having lived and worked in it.

THE NON-EXISTENCE OF MYDRIATIC ALKALOID IN LACTUCA VIROSA.

By J. O. Braithwaite and H. E. Stevenson.

In a communication to the Chemical Society some years ago (*Pharm. Journ.* [3], **22**, 449), T. S. Dymond announced the isolation of hyoscyamine from "commercial specimens of extract of wild lettuce and of the variety of the edible plant known as cos lettuce, and from a dried flowering plant of the wild lettuce."

Although the matter attracted some attention at the time among pharmacists, who had not expected the occurrence of this alkaloid in a member of the natural order Compositæ, and among the lay public, who were interested to learn of the presence of this poison in a favourite salad herb, an interest which was duly reflected in a leading article of a quasi-scientific character in the London *Daily Telegraph*, it does not seem to have occurred to any one to employ the very delicate and sensitive physiological test with the juice of the plants, and thereby confirm or refute the conclusions of the author.

The recent appearance of a considerable number of plants of the wild lettuce, *Lactuca virosa*, at Hale End and Chingford, in Essex, has again attracted our attention to the subject and furnished us with material for applying the test. This we have done with negative results. We are unable to obtain the least trace of mydriatic action by the application to the eye of such solutions as would contain hyoscyamine were that base present in the plant.

Four hundred grammes of the fresh flowering herb (which was some 4 ft. high) was crushed in a mortar a few hours after gathering, covered with sufficient 5 per cent. aqueous hydrochloric acid and macerated, in the cold, for forty-eight hours, with frequent agitation. The liquid portion was then removed by straining, the residue strongly pressed, and the bulked liquid filtered. This acid aqueous extract was then shaken out with ether, and the ethereal layer removed. The acid liquid was then made alkaline with ammonia and again shaken out with ether. This separated ether should contain the bulk of the mydriatic alkaloid, if such were present. It was accordingly shaken out with a small volume of water, slightly but distinctly acidified with hydrochloric acid. Several drops of this acid aqueous solution applied to one eye of each of us failed to give the slightest indication of mydriasis.

The acid liquid was then again rendered alkaline with ammonia and shaken out with two successive quantities of ether, which were evaporated at normal temperatures in a small glass capsule. The residue was imperceptible. The glass capsule was washed round and gently warmed with a small quantity of very dilute hydrochloric acid, and the solution applied to one eye of three individuals, several drops being instilled in each case. Again, no trace of mydriasis was observed, the pupil of the eye in all three individuals remaining normally undilated, and of the same size as that of the untreated eye. The same eye was treated in each case, so that had any trace of mydriatic base been present in the first application, it would have aided the reaction in the second dose.

In consequence of these results we are forced to the conclusion that wild *Lactuca virosa* does not contain a mydriatic alkaloid, even in such minute trace as will give the very delicate physiological reaction.

NOTE ON THE CHLOROFORMS OF BELLADONNA AND ACONITE OF THE CONFERENCE FORMULARY, WITH SUGGESTIONS FOR THEIR IMPROVEMENT.

By R. Wright, F.C.S.

Pharmaceutical Chemist.

The processes for the preparation of the above galenicals are both more or less faulty, and the resulting products are equally unsatisfactory, showing a remarkable variation in character and potency. The experiments herein detailed were set on foot with the object of ascertaining the lines on which it would be necessary to proceed in order to secure really active and reliable preparations.

Chloroformum Belladonnæ.

The process of the Formulary has been adversely criticized by P. W. Squire,[1] who states that the result obtained by it is no better than by the original process of simple percolation of the root given in the companion.[2] In a record of some experiments on the subject carried out by W. A. H. Naylor, this statement was fully confirmed.[3]

[1] *Pharm. Journn.* [3], **24**, 820.
[2] *Squire's Companion*, ed. xvi. p. 127.
[3] *Pharm. Journ.* [3], **24**, 562.

Examination of Commercial Samples.

Six commercial samples were obtained, and the alkaloids determined by the following modification of the official assay process:—

Introduce 10 c.c. of the sample into a bottle provided with a good cork. Mix 5 c.c. diluted sulphuric acid, B.P., with 25 c.c. distilled water, divide into three equal portions and shake the chloroform with each in turn, drawing off after separation. If the liquids do not separate readily, stand the bottle in hot water, removing the cork occasionally. Should this not suffice, add a few drops of alcohol and shake, when separation will take place immediately. Bulk the acid liquids, add solution of ammonia in distinct excess, shake out the alkaloids with three successive quantities of 10 c.c. chloroform, drawing off each in turn. Mix the chloroformic alkaloidal solutions. This process of extraction is repeated twice more (i.e., until the alkaloids have been thrice extracted with acidulated water). Finally, they are obtained in solution in chloroform, the chloroform recovered, the alkaloids dried over a water-bath and weighed, the weight being subsequently checked by titration. If the final acid solution be water-white, and the alkaloidal residue colourless, the volumetric and gravimetric results will closely correspond.

The quantity of alkaloid present in the commercial samples, expressed as Gr. per 100 c.c., was as follows: 1 = 0·016; 2 = 0·018; 3 = 0·122; 4 = 0·096; 5 = 0·012; 6 = 0·032.

The maximum amount possible in a strictly B.P.C. preparation, supposing perfect exhaustion of the root to have been effected, would be from about 0·2 to 0·4 Gm. per 100 c.c. From which it is evident that commercial samples of the preparation do not contain more than a small proportion of the available alkaloid.

Experiments on Alternative Processes.

For the purpose of these experiments two samples of English root in No. 60 powder were obtained. They were assayed by a process of extraction with alcohol till exhausted, and subsequent determination of the alkaloid in the tincture. A yielded alkaloid corresponding to 0·30 per cent., and B 0·38 per cent. From each of these samples, chloroform of belladonna was prepared by the following processes:—

1. *Simple Percolation.*

This is Squire's original process (vide *Companion*, ed. xvi. p. 127):—

Take of—

Belladonna root in No. 60 powder	4 oz.
Chloroform, a sufficient quantity.	

Pack the powder in a conical percolator and percol
4 fl. oz.

2. *B.P.C. Process* (q. v., p. 14).

N.B. 6 fl. oz. percolated from 4 oz. drug.

3. *Acid Process* (1).

Take of—

Belladonna root in No. 60 powder	4 oz.
Chloroform (containing 1 per cent. by volume Glacial acetic acid), a sufficient quantity.	

Pack the powder in a conical percolator, percol
4 fl. oz.

4. *Acid Process* (2).

As No. 3, but using chloroform containing 2 per cent. by
glacial acetic acid.

5. *Squire's Alkaline Process* (vide *Companion*, ed.
127).

Take of—

Belladonna root in No. 60 powder	4 oz.
Ammonium carbonate in powder	¼ oz.
Calcium hydrate	¼ oz.
Chloroform, a sufficient quantity.	

Mix the powders, pack closely in a conical percolator, per
to 4 fl. oz.

6. *Ammoniated Chloroform Process.*

Take of—

Belladonna root in No. 60 powder	4 oz.
Ammoniated chloroform, a sufficient quantity.	

Pack in a conical percolator, percolate to 4 fl. oz.

7. *Potassium Carbonate Process.*

Take of—

Belladonna root in No. 60 powder	4 oz.
Potassium carbonate	½ oz.
Distilled water	4 oz.

Dissolve the potassium carbonate in the distilled water, mo
the powder thoroughly, set aside for twelve hours. Dry
fully, reduce to No. 60 powder, pack in a conical percolator,
colate to 4 fl. oz.

The preparations resulting from the above processes were assayed, with the results shown in the following table:—

Table 1.
Showing alkaloidal content of samples of Chloroformum Belladonnæ.

Sample.	Process.	Alkaloids in Grammes. from 100 c.c.	Approximate Degree of Exhaustion Effected.
I. A B	Squire's Simple Percolation.	0·048 0·082	16 per cent. 8·5 per cent.
II. A B	B.P.C.	0·006 0·004	2 per cent. 1 per cent.
III. A B	Acid Process (1)	0·048 0·044	16 per cent. 12 per cent.
IV. A B	Acid Process (2)	0·084 0·098	28 per cent. 26 per cent.
V. A B	Squire's Alkaline Process.	0·080 0·072	27 per cent. 19 per cent.
VI. A B	Ammoniated Chloroform.	0·040 0·076	18 per cent. 20 per cent.
VII. A B	Potassium Carbonate.	0·008 0·016	8 per cent. 4 per cent.

None of these results were deemed satisfactory, although the products of processes III. and IV. showed an improvement upon the others. But it was evident that in order to secure anything like perfect exhaustion of the drug, both process and menstruum would require modification.

The modification required in the process is one which will serve to bring the particles of the drug during percolation into closer contact so as to ensure complete penetration of the tissues by the menstruum. This can be expedited by using the drug in very fine powder, and still more by moistening the powder with menstruum

before transferring to the percolator, so as to secure the tightest possible packing.

The modification of the menstruum is a matter of difficulty, seeing that the range of liquids fulfilling the requisite condition of being miscible alike with chloroform and oils is so limited. The two which promised best were absolute alcohol (either pure or ammoniated), and glacial acetic acid.

Further experiments were therefore made, working on the above lines, and employing as menstruum mixtures of chloroform, alcohol, and glacial acetic acid. It was not feasible to reduce the belladonna root to a finer powder, hence the samples previously employed were also used in the following experiments. Moreover the supply of sample B was now almost exhausted, only sufficient remaining to admit of its utilization for two of the experiments.

The following processes were tried :—

1. Take of—

Belladonna root in No. 60 powder	4 oz.
Glacial acetic acid	½ fl. dr.
Absolute alcohol	1 fl. dr.
Chloroform	1 fl. oz.

Mix the liquids, moisten the powder, pack quickly and tightly in a conical percolator—percolate with a mixture of seven volumes chloroform and one volume alcohol. The percolate was collected in three fractions, the first of 4 fl. oz., the second and third of 2 fl. oz. each.

2. Take of—

Belladonna root in No. 60 powder	4 oz.
Glacial acetic acid	1 fl. dr.
Absolute alcohol	1 fl. oz.
Chloroform, a sufficient quantity.	

Mix the acid and alcohol, moisten the powder with the mixture, pack tightly, set aside for twelve hours, then percolate with chloroform. The percolate was collected in fractions as before.

3. Take of—

Belladonna root in No. 60 powder .	4 ozs.
Glacial acetic acid	1 fl. dr.
Chloroform	15 fl. dr.

Mix the liquids, moisten the powder, pack quickly and tightly, set aside for 12 hours, percolate with chloroform. Collect the percolate in fractions.

4. Take of—

Belladonna root in No. 60 powder . 4 oz.
Absolute alcohol . . . . 2 fl. dr.
Chloroform . . . . 14 fl. dr.

Mix the liquids, moisten the powder, pack quickly and firmly, percolate with a mixture of 7 volumes chloroform and 1 volume absolute alcohol. Collect as before.

The alkaloids in the different fractions were determined, with results shown in Table 2.

Table 2.

Sample of Drug.	Process.	Amount of Alkaloid in Grammes from 100 c.c. (Calculated).	Approximate Proportion of Alkaloid Extracted from Drug.
	I.—Fraction (1) . .	0·160	53 per cent.
	" (2) . .	0·048	9 per cent.
	" (3) . .	0·032	6 per cent.
	I.—Fraction (1) . .	0·108	28 per cent.
	" (2) . .	0·040	6 per cent.
	" (3) . .	0·025	3·5 per cent.
A	II.—Fraction (1) . .	0·100	33 per cent.
	" (2) . .	0·048	9 per cent.
	" (3) . .	0·020	4 per cent.
A	III.—Fraction (1) . .	0·110	37 per cent.
	" (2) . .	0·032	6 per cent.
	" (3) . .	Not collected.	...
A	IV.—Fraction (1) . .	0·162	54 per cent.
	" (2) . .	0·068	13 per cent.
	" (3) . .	0·048	9 per cent.
B	IV.—Fraction (1) . .	0·112	30 per cent.
	" (2) . .	0·055	8 per cent.
	" (3) . .	0·200	3 per cent.

Judging from the figures given in the table, all of which show a vastly increased yield of alkaloid, the best results attend the use of a menstruum containing alcohol.

Squire has stated (*Companion*, ed. xvi., p. 126) that the best alkaloidal solvent for belladonna is ammoniated alcohol, and

it occurred to me that quite possibly a mixture of this with chloroform would give even better results than had been obtained with the chloroform-alcohol menstruum.

Experiment IV. was therefore repeated, substituting ammoniated alcohol for the absolute alcohol in the formula, and using drug sample A.

The percolate gave the following amount of alkaloid :—

Fraction (1). 25 c.c. = 0·049 = 0·196 per cent.
„ (2). 25 c.c. = 0·012 = 0·048 „
„ (3). Not collected.

It will be seen that 65 per cent. (about two-thirds) of the available alkaloids appear in the first fraction, showing the best results yet obtained.

It appeared to be worth while repeating this experiment alongside one or two others, on another sample of drug. Accordingly, a good specimen of English root in fine powder was obtained, yielding about 0·5 per cent. alkaloids, and samples of chloroform of belladonna were prepared from this by processes I. and IV., also by the latter with the substitution of ammoniated alcohol for absolute alcohol.

N.B. The former is best prepared in small quantities by passing ammonia gas (obtained by slightly warming a flask containing strong liquid ammonia) into absolute alcohol until the latter is saturated.

The results of this series of experiments are shown in Table 3:—

Table 3.

Process.	Alkaloid in Grammes from 100 c.c.	Approximate Proportion of Alkaloid Extracted from Drug.
I. Fraction (1)	0·292	58·5 per cent.
„ (2)	0·116	18 per cent.
„ (3)	0·072	8 per cent.
IV. Fraction (1)	0·280	56 per cent.
„ (2)	0·140	15·5 per cent.
„ (3)	0·120	13·5 per cent.
IV. Modified—Fraction (1)	0·344	69 per cent.
„ (2)	0·076	8·5 per cent.
„ (3)	0·032	3·5 per cent.

It will be seen that these results are more satisfactory than any previous ones, also that the ammoniated menstruum comes out best.

More complete exhaustion could doubtless be effected in the case of the alcohol-chloroform preparations by increasing the proportion of alcohol to 20 or 25 per cent., but there are obvious objections to carrying this too far.

The one objection to be urged against the employment of an ammoniated menstruum is that the natural combination of the alkaloid in the drug is disturbed, and that *pro tanto* the product ceases to be a true galenical.

CHLOROFORMUM ACONITI.

A similar series of experiments to those recorded in connection with chloroform of belladonna was carried out with this preparation.

EXAMINATION OF COMMERCIAL SAMPLES.

Six of these were obtained and submitted to examination with the following results:—

No.	Alkaloid in Gms. Per 100 c.c.
1	0·020
2	0·044
3	0·082
4	0·028
5	0·016
6	0·080
Average	0·037

EXPERIMENTS ON ALTERNATIVE PROCESSES.

The experimental samples were prepared from a specimen of English aconite root, yielding on assay 0 46 per cent. total alkaloid. The processes followed were the same as those outlined under belladonna. The results are given in the following table:—

Table 4.

No.	Process.	Total Alkaloids in Grammes from 100 c.c.	Approximate Degree of Exhaustion Effected.
1	Simple percolation	0·172	37 per cent.
2	B.P.C.	0·014	3 per cent.
3	Acid (1)	0·224	49 per cent.
4	Acid (2)	0·220	48 per cent.
5	Alkaline	0·180	40 per cent.
6	Ammoniatedchloroform	0·196	43 per cent.

Further experiments were then carried out, using the same root and collecting the percolate in fractions, following the details of the second series of process experiments given under belladonna. The results are shown in Table 5.

Table 5.

Process.	Total Alkaloids in Grammes from 100 c.c.	Approximate Degree of Exhaustion Effected.
I. Fraction (1)	0·372	80 per cent.
" (2)	0·032	4 per cent.
" (3)	0·028	3·5 per cent.
II. Fraction (1)	0·365	79 per cent.
" (2)	0·048	6 per cent.
" (3)	0·040	5 per cent.
III. Fraction (1)	0·328	71 per cent.
" (2)	0·024	8 per cent.
" (3)	0·004	0·5 per cent.
IV. Fraction (1)	0·404	88 per cent.
" (2)	0·044	5 per cent.
" (3)	0·040	5 per cent.

Practical Notes and Conclusions.

Chloroform alone is not a good solvent for the alkaloids of belladonna in their natural state of combination in the drug. It is better adapted for the extraction of the aconite alkaloids, probably because these exist largely in a free condition in the root. In order to facilitate extraction several expedients may be resorted to. The usual modification has consisted in the addition of an alkali to the crude drug in order to break up the alkaloidal combination, and leave the alkaloids in the free condition to be acted upon by the menstruum. The Formulary process is one of this character, but in my hands it has proved an almost total failure. The same object may be obtained by the addition of a small proportion of glacial acetic acid to the chloroform, and the resulting product is fairly satisfactory.

The modification of the menstruum by the addition of 10 per cent. absolute alcohol gives a greatly improved preparation

The best result, taking the proportion of alkaloids present as the standard of strength, is obtained by the addition of a small proportion of ammoniated alcohol to the chloroform used for extraction, and although the resulting preparation can hardly be regarded as a true galenical, seeing that the natural combination in the drug is broken up, it is nevertheless so far in accord with the formulary preparation that I feel justified in proposing its adoption.

The form may be outlined as follows:—

Take of—

Belladonna (or aconite) root in fine powder . . 20 oz.
A mixture of ammoniated alcohol, 1 volume,
Chloroform, 7 volumes . . . A sufficient quantity.

Moisten the powder quickly and thoroughly with 10 fl. oz. of the menstruum. Pack firmly in a conical percolator provided with a closely fitting cover. Pour on successive quantities of the menstruum and allow percolation to proceed until one pint has been collected.

It is my pleasurable duty to acknowledge the kindness of Messrs. Wright, Layman, and Umney in providing me with the sample of finely powdered English belladonna root referred to in the paper.

THE REFRACTIVE INDEX OF ESSENTIAL OILS.

By Ernest J. Parry, B.Sc., F.I.C.

The refractive index of essential oils has long been put on one side as not affording information commensurate with the trouble involved in its determination.

In many cases there can be no doubt that this is the only conclusion one could arrive at, as, for example, the oils of the citrus family. The following are figures obtained for normal samples of lemon and orange oil, together with those of turpentine and lemon terpenes. (All determinations are for the D. line at 20° C.)

Oil of Lemon.	Oil of Orange.	Turpentine.	Lemon Terpenes.
1·47575	1·47350	1·47059	1·47458
1·47485	1·47460	1·47208	1·47521
1·47448		1·47200	
1·47385			

It is clear that nothing more than a vague indication can be obtained in cases of admixture with large quantities of either lemon-terpenes or turpentine, of either lemon or orange oil.

A direct determination of the refractive index on many essential oils will lead to identical results, although there are cases where very clear indications, not only of adulteration, but also of the adulterant, may be obtained.

It is, however, not until the oil is fractionated and the fractions of fairly constant properties are thus examined, that the full value of the refractive index is rendered apparent.

This is easy to understand, as the oils themselves are not constant mixtures, and may have practically identical refractive indices whilst being of very different compositions. But fractions obtained at definite temperatures are to be expected to have fairly constant characters, and an examination of a fractionated oil will often lead to very useful results.

The great value of the refractive index of essential oils when appreciated in this way has been emphasized by Burgess and Child on several occasions, and quite recently Umney, Bennett, and myself have used it to very great advantage. The recent papers on citronella oil and peppermint oil, published by Bennett and myself in the *Chemist and Druggist*, have demonstrated the valuable information which has thus been obtained. In the latter case a body, which, I think I may say, we could not identify for some time, was found in the later fractions of the oil. We found, however, that it had a refractive index of over 1·5000, and were by this means able to place it in a very limited group of bodies, and finally to decide by further examination that it was African copaiba oil.

The object of the present note is merely to draw attention to the value of the refractive index when used with discretion, and not to publish a set of constants. Later I hope to publish a series of figures which will assist in demonstrating where this figure is, and where it is not of value, and figures from other observers will be welcomed.

In several other cases I have already found it of much value, amongst which is otto of rose. Here the fact that geraniol and so-called Indian or Turkish geranium oil have much higher refractive indices than otto of rose (or citronellol) enables one to use the determination to advantage. The following figures represent (1) five samples of pure otto of rose of this season's crop; (2) two samples of commercial geraniol; (3) four samples of "Turkish" geranium oil; (4) two samples of citronellol:—

Otto of rose, pure . .	1·46190, 1·46095, 1·46148, 1·46145, 1·46208
Geraniol	1·47923, 1·47995
Turkish geranium oil	1·47602, 1·48055, 1·47958, 1·47850
Citronellol	1·45718

Several commercial samples had refractive indices of 1·46700 to 1·47100, and are at least open to very grave suspicion. I propose to return to this subject very fully in the course of a few months.

GENERAL BUSINESS.

Presentation from the Bell and Hills Fund.

The PRESIDENT then presented the following books from the Bell and Hills Fund to the Bristol Pharmaceutical Association: White and Humphrey's *Pharmacopedia*, Mendeleeff's *Chemistry*, Greenish's *Mat. Medica*, Tuson's *Vet. Pharmacopœia*, Quain's *Dictionary of Medicine*, Squire's *London Hospitals' Pharmacopœia*, Bernsthen's *Organic Chemistry*, Green's *Botany*, Green's *Introduction to Vegetable Physiology*.

Mr. J. W. WHITE, President of the Bristol Pharmaceutical Association, thanked the Conference for the books, and said the books received on the occasion of the previous visit of the Conference to Bristol had been well thumbed, and he had no doubt that these books would also be made good use of.

Election of the Formulary Committee.

Mr. J. RUTHERFORD HILL, in moving the appointment of the Formulary Committee, said: Ladies and gentlemen, I submit this resolution in very few words, but I would just like to say that I think this Committee is one of the most distinctive and useful features of the work of this Conference. The Formulary Committee has done most valuable work in the past, and I believe at the present moment the Committee has a very large amount of important and useful work before it for consideration. It has been said that recently less attention has been paid to this Committee and its duties, and I think the reason is that it was carried on at the start with such energy, foresight, and diligence, that they filled up the wants for some time to come. Now, under existing conditions and in view of recent events, I think the Committee has been given an opportunity for some important work. Recently there has been a suggestion for a standard work or formulæ issued in the name of some recognized and authoritative

body, which might be available for a purpose that I will not enter into in detail, as it will be in the minds of most members of the Conference what I allude to, and I think this Committee might very well provide such a formulary. It will be evident that such a formulary would be produced with prudence and discretion with regard to the high standard of professional honour and without the slightest attempt to cater to any unworthy motive. It would also be thoroughly practicable, and that I think is a very important element. Indeed, its thorough practicableness may be safely left to the following gentlemen whose names I submit for election on the Formulary Committee: Messrs. N. H. Martin (Chairman), A. C. Abraham, W. A. H. Naylor, F. C. J. Bird, Peter Boa, C. Symes, F. Ransom, W. F. Wells, J. C. Umney, Harold Wilson, Harry Wilson and R. Wright. We all regret that Mr. Naylor is giving up his secretarial duties, and we all endorse the thanks the Committee has accorded him, and we are glad that Mr. Bird is to succeed him.

Mr. GERRARD, in seconding the motion, said: I know that the Committee has done excellent work in the past and we expect them to do practical work in the future; we may expect good work from them. As Mr. Hill has rightly said, there will undoubtedly be plenty of work for them to do, and you will have every confidence in these gentlemen in carrying out the duties of this Committee.

The motion was unanimously carried.

Place of Meeting for 1904.

Mr. NEWSHOLME said: Mr. President, ladies and gentlemen, I am here to-day with some of my Sheffield friends to give a very cordial invitation to the Conference to visit Sheffield next year. Twenty-four years ago the British Pharmaceutical Conference visited Sheffield. We have—at any rate, those of us who took part in that Conference—a very happy recollection of that visit, and some of us who took part in it have been looking forward for some years to a return visit. We had hoped that it might have been made a little earlier, but I find that we are not quite so long in again inviting the Conference to Sheffield as some other cities and towns have been. When I visited the Conference at Dundee I gave a sort of hint that I should come here to invite it to visit Sheffield. I have just turned up the *Year-Book* of last year, in which I am reported as having said that I should come

here to speak of the glowing beauties of Sheffield. I rather think I gave myself away in speaking such words. But if I had the command of language and the magnificent eloquence of the President of the Pharmaceutical Society I could describe some of the beauties of Sheffield. I could speak of the beauties of the huge chimneys at Sheffield, its enormous blast furnaces and its huge mountains of refuse from coal-pits. I must not refer to any more of the beauties of Sheffield, but I may say that there is a bright side to this imperfect picture, viz., that these commercial and industrial characteristics bring in money. It is true that our streets and the atmosphere is very well charged with smoke, and that there is, as a friend of mine once said, something to breathe at in Sheffield, but apart from that Sheffield has magnificent surroundings. It has thousands of acres of moorland, while there is Chatsworth House, the old Baronial Hall of Haddon, and other places of interest within easy reach. Should the Conference accept this invitation to visit Sheffield next year we shall endeavour to show you some of our smoke, some of our works, and something of the beauties of the surrounding country, and we will do the best we can to give you a hearty welcome.

Councillor Fox said: Mr. President, ladies and gentlemen, I rise to support my friend, Mr. Newsholme, in his very hearty invitation to you that you will come to Sheffield next year. I do not quite agree with some of the remarks that my friend made with regard to Sheffield and its atmospheric influence. I feel that he might frighten some of you, but I can assure you that if you come to Sheffield you will find that we are not quite so black as we are painted. We have got some very beautiful things. There is an excellent tram service which will carry the visitor to any part of the city for a penny; we have parks which are among the finest in the kingdom; then the Ruskin Museum would be of interest and other museums and picture galleries, and I think pharmacists would be greatly interested in the way we cut files and knives, and also the way the great guns and plates are manufactured.

Mr. George Squire also supported the invitation. He said We shall do our best to make the Conference of 1904 a great success.

Mr. G. D. Beggs moved that the invitation to Sheffield be accepted. He said: I am sure after the very beautiful description we have had from Mr. Newsholme, it requires very little pressure to be put upon this meeting to accept the very kind invitation that these gentlemen have given to this Conference. Of course,

not having been to Sheffield I am supposed to know everything about it, but I am sure that when we go to Sheffield we shall see something out of the common. We Irishmen are told that we are remarkable for our sharp wit, but when we go to Sheffield we shall be sharpened to such an extent that, goodness help us! when we go back—Ireland will not hold us.

Mr. EDWARD EVANS, JUNR., in seconding the motion, said: Mr. President, I have an advantage over Mr. Beggs in seconding this, because I have been to Sheffield and I have been there at a Conference—but not a British Pharmaceutical Conference—and I know what a Yorkshire welcome means. I quite agree with everything that Mr. Newsholme has said of the beauties surrounding Sheffield. Another reason why we members of the Conference ought to go to Sheffield is that we owe a debt of gratitude to that city for having for three years past provided one of the most popular presidents the Pharmaceutical Society has ever had. Now, I think it would show our appreciation of his efforts in a very difficult position, at a very difficult time and in difficult circumstances, if we accept the invitation he has so cordially given us, and after you have been you will agree that we could not go to a better place than Sheffield in the county of Yorkshire.

The PRESIDENT said: I have been to Sheffield and I have heard it described as being in the midst of heaven, and I am quite sure that, if you go, you will have that realization.

The motion was then put and carried with acclamation.

Resignation of Mr. Ransom.

Mr. NAYLOR said: Mr. President, A very important resolution has been placed into my hands, and I have very much pleasure in moving it. I can only regret that the time has passed so rapidly that it will scarcely be possible to do justice to it. This is one of those occasions when one realizes what a very poor vehicle language is for the expression of one's deepest feelings, and especially when one is required and desires to express the sentiment of gratitude. I am sure we all learned with the very deepest regret that the senior Hon. General Secretary of the Conference has felt it incumbent upon him to tender his resignation. He has held that position for the past thirteen years. He has not only held that position, but he has filled it with the greatest possible advantage to the Conference, and what is perhaps highest of all, he has adorned that position. And now, ladies and gentlemen, I

feel I must confess to being just a little embarrassed speaking in the presence of my old colleague, but I wish to say one or two words as to the character of the man of whom I am speaking and of his work. We all know how he has laboured for the good of the Conference during the past thirteen years; his labour has been unstinted. Years ago he sought to know the need of the Conference, and then he resolutely set himself and applied himself most assiduously to meet that need, and I am bound to say that during that period the Executive Committee has found in Mr. Ransom a man wise in council, a man of great industry, indefatigable zeal, and a man of one consuming desire, viz., to further the interests of the British Pharmaceutical Conference, and in that work he has admirably succeeded. Now, Mr. President, there is only one regret I feel, and that is that you, as the President of the Conference, have not such patronage that you can bestow upon our dear friend Mr. Ransom some distinction —a distinguished service order. But that I believe the members of the Conference are prepared to do, and we shall do here to-day that which we can do — we shall elevate him to the position of one of the Vice-Presidents of the Conference. I hope I may be allowed also to make one single reference to Mrs. Ransom. All public men know that their wives are called upon very often to exercise a very great deal of self-denial, and I know that Mrs. Ransom has admirably seconded Mr. Ransom in his work in connection with the Conference, and we shall all look forward for years for their presence and help. The resolution I have to move is: "That the British Pharmaceutical Conference regrets that Mr. Ransom has felt it obligatory to tender his resignation as senior Honorary Secretary of the Conference, and the members offer their sincere and heartiest thanks for his long and valuable services."

Dr. SYMES said: I have been asked to second this resolution, and I regret that it is a resolution which one cannot second with unmixed pleasure. I cannot help feeling a deep regret at the loss of Mr. Ransom as Senior Honorary General Secretary of this Conference, yet it is a pleasure to be able to award him our best thanks for his services. Mr. Naylor has spoken very feelingly, because he has worked with Mr. Ransom, and has been associated with him in the work of the Conference. We all know Mr. Ransom's modesty, but I cannot help saying how much we admire the assiduity and the supreme ability with which he has filled

office for so many years. The success of this Conference largely depends upon the Secretaries; this Conference would cease to exist unless a large amount of work—which, I am afraid, sometimes means burning the midnight oil—was not done by the Secretaries, and the Conference would not go on and prosper as it is now doing. The only satisfaction we have in this matter is that we shall still have the very best advice of Mr. Ransom, and that we are not losing him altogether. We hope to have some one who will do the duties of the Secretary as efficiently as hitherto, but at the same time we hope that Mr. Ransom will still do what he can to make this Conference a success. We all feel a deep debt of gratitude for his able and admirable services to this Conference.

The PRESIDENT said: I wish to endorse all that has been said. To know Mr. Ransom is to love him, and it is because we love him and do not wish to drive a willing horse too far, that we accept his resignation.

The resolution was carried with applause.

Mr. RANSOM, responding, said: On such an occasion as this I particularly feel the lack of the great eloquence which my friend Mr. Naylor possesses, and I feel quite unable to express my gratitude for the kind words you have just spoken. I must say that any success which has attended the Conference during the thirteen years I have been in office has been due almost entirely to the good fortune I have had in the other officials with whom I have worked. As you know, I have had the great good fortune to have my friend Mr. Naylor for my colleague, and I am sure it would have been impossible to have had any one more suitable for a colleague than Mr. Naylor. Since his retirement Mr. Peck has taken his place, and I leave the work in his hands with the confidence that he will make the Conference a success as far as it is possible. I should also like to mention the great service rendered by Mr. Umney. I feel that sometimes Treasurers are not always recognized, but it is real work for the Conference, and he has devoted much time and trouble to the work of the Conference. I have formed many friendships which I hope to be lifelong, and I trust will be. I can assure you that my interest will not cease, but will increase. On behalf of Mrs. Ransom, I thank you for the kind way in which you have referred to her.

Election of Officers.

Mr. ATKINS said: I beg to propose that the following list of

officers for 1903–4 be accepted by this Conference. You have the list before you, and time is very precious, so I will not read out the names.

President.—T. H. W. Idris, L.C.C., J.P., F.C.S., London.

Vice-Presidents.—G. T. W. Newsholme, F.C.S., Sheffield; G. D. Beggs, M.P.S.I., Dalkey, co. Dublin; D. B. Dott, Edinburgh; F. Ransom, Hitchin; W. A. H. Naylor, F.I.C., F.C.S., London.

Honorary Treasurer.—J. C. Umney, F.C.S., London.

Honorary General Secretaries.—E. Saville Peck, M.A., Cambridge; Edmund White, B.Sc., London.

Honorary Local Secretary.—H. Antcliffe, Sheffield.

Assistant Secretary.—John Hearn.

Other Members of the Executive Committee.—F. C. J. Bird, London; H. E. Boorne, Bristol; H. W. Gadd, Exeter; W. Garsed, London; Professor Greenish, F.I.C., F.L.S., London; H. E. Matthews, Bristol; C. T. Tyrer, London; R. Wright, Buxton; G. Squire, Sheffield.

Auditors.—J. W. Bowen, London, and W. P. Robinson, London.

Editor of the "Year-Book."—J. O. Braithwaite.

Mr. DRUCE seconded the motion.

The PRESIDENT: It is a matter of very great satisfaction to know, and I know that it is satisfactory to Mr. Ransom to know, that that very excellent pharmacist and very able colleague, Mr. Edmund White, is going to take up the duties of secretary.

The motion was then carried.

VOTES OF THANKS.

Mr. ATKINS said he had the very charming duty of proposing that the warmest thanks of the visiting members of the Conference be given to the Local Committee, Mr. J. W. White (Chairman), Mr. H. E. Boorne (Secretary), Mr. H. E. Matthews (Treasurer), and Mr. G. T. Turner (a Vice-President). Bristol had a reputation to maintain. Twenty-eight years ago the Conference visited Bristol, and a charming time its members had. At that time he (Mr. Atkins) was Mayor of his own city, and he came to Bristol and invited members of the Conference to come and see Stonehenge and his own city, and he was very glad to say that something like 150 accepted that invitation, including Mr. J. W. White and his old friends Giles and Schacht. On the present occasion the Local Committee had done excellently—there

had been two things at work: one was prevision and the other provision, and both had been admirably fulfilled.

Mr. CHARLES KERR seconded the vote of thanks, which was carried unanimously.

Mr. J. W. WHITE, in responding, thanked Mr. Atkins and Mr. Kerr for the very kind words that had fallen from them. On behalf of the Committee he tendered their sincere thanks. They had had the sincerest pleasure in working for the success of the Conference, and if they had fallen short in any matter it was on account of want of sufficient practice.

Mr. H. E. BOORNE said he could only re-echo what Mr. White had already said. It had been a great pleasure to see the members of the Conference, and to welcome them to Bristol. There had been a certain amount of detailed work to be done before the week of the Conference, but during that week they forgot all about it.

Mr. G. T. TURNER said the anticipation of seeing the members of the Conference at Bristol had been an incentive to work, and the Local Committee had been amply repaid by the pleasure of meeting them. It had been a real pleasure to meet the representatives of pharmacy throughout the United Kingdom.

Mr. H. E. MATTHEWS said he did not wish to add anything to what had been said, except that it had afforded the Local Committee a great deal of pleasure to meet the members of the Conference, and the pharmacists of Bristol counted it a great honour to have had the privilege of entertaining them.

THANKS TO PROFESSOR LLOYD MORGAN.

Dr. POWER moved that the heartiest thanks of the Conference be accorded to Professor Lloyd Morgan for his very kind welcome to the Conference, and also to the authorities of University College for so kindly lending the College premises.

Sir THOMAS ROBINSON seconded the motion, and it was carried.

THANKS TO THE PRESIDENT.

Mr. DRUCE moved a vote of thanks to the President for his service in the chair.

Mr. T. TYRER, in seconding the vote of thanks, said it would not be inappropriate to refer to just one point, viz., that very few of the members of the Conference had regarded Mr. Idris as having

direct connection with pharmacy; they had associated him more particularly with business and public matters, and it was a very great gratification to know that he had been so closely connected with pharmacy.

The motion was carried unanimously.

The PRESIDENT replied, and moved a vote of thanks to the Hon. Secretaries.

Mr. MABEN seconded, and it was carried with acclamation.

Mr. PECK, in responding, promised to endeavour to follow in the steps of Mr. Ransom. He was glad to have the assistance of Mr. White.

THE SOCIAL GATHERINGS.

THE RECEPTION.

This took place at the Royal Hotel on Monday evening, July 27, and was attended by about 250 guests, who were heartily welcomed by The Right Honourable the Lord Mayor, Sir Robert H. Symes and Lady Symes, together with Mr. and Mrs. Idris and Mr. and Mrs. J. W. White.

It was interesting to watch the company assembling, and see the many warm hand-shakes as one after another the members greeted friends new and old.

The Lord Mayor "spoke kindly of the Pharmaceutical calling," and extended a cordial welcome to the Conference. He was heartily thanked for his kindness by the President of the Conference and the Presidents of the Pharmaceutical Societies of Great Britain and Ireland. The merry buzz of conversation was then resumed and a move was made into the vestibule, where light refreshments were exquisitely served. The Musical Programme was then commenced, Miss Edith Evans and Miss E. Chambers contributing songs, and Miss Violet Bryant a violin obbligato. Dancing commenced shortly after nine o'clock, and evidently gave great pleasure to many until long past midnight.

In another room in the Hotel a Smoking Concert was held with such success that the numbers who sought admission rather overtaxed the accommodation until a happy suggestion was made of moving the Concert to the landing, and this gave ample room for all comers.

The success of the efforts of the Local Committee was everywhere praised.

EXCURSION TO BATH.

After the sessions of Conference on Tuesday afternoon, train was taken to Bath, which was reached shortly after 5 p.m. Several local Pharmacists met the party at the station and conducted them to the Roman Baths. In the absence of the Mayor of Bath, Dr. Phillips warmly welcomed the members.

Alderman Moore gave a most interesting lecture upon the Baths, drawing attention to their antiquity, being built when Claudius and Hadrian were Emperors of Rome—the excellence of the plumbing of those days, and the high temperature and constant supply of about half a million gallons a day of this world-renowned water.

Mr. Idris and Mr. S. R. Atkins cordially thanked Dr. Phillips and Alderman Moore.

An excellent tea was served in the old Colonnade near by.

The Abbey Church was then visited, and the Rector very kindly pointed out and explained "the many interesting architectural features." His kindness was much appreciated.

Several climbed the staircase to the top of the Tower, and were rewarded by a most extensive and beautiful view of Bath and its environs, while others visited the Museum and Victoria Park, thus filling up the time for the return journey to Bristol.

It was voted by all to have been a great success.

THE GARDEN PARTY.

After the usual votes of thanks on Wednesday, members and friends made their way to Mr. J. W. White's house, "Warnham," Woodland Road, where Mrs. White most kindly entertained with afternoon tea.

The company then proceeded to the Zoological Gardens, but heavy showers of rain somewhat spoiled the evening and caused the Local Committee considerable anxiety: fortunately they had well provided for such a contingency. A large marquee had been erected, where tea was served, after which the Society of Bristol Gleemen were kind enough to entertain the company with no less than fifteen delightfully-rendered items.

Owing to the inclemency of the weather, an early return was made for the Headquarters Hotel, where an impromptu Smoking Concert was got up and thoroughly enjoyed, thanks to the will-

ingness of musical members and their lady friends. Mr. Layman occupied the chair in his usual facetious and inimitable style.

THE EXCURSION TO THE FOREST OF DEAN AND TINTERN.

A special train, consisting mostly of saloon carriages, left Temple Meads Station shortly before 10 a.m. The route lay through the Severn Tunnel and by Chepstow and Lydbrook Junction to Speech House Station. The historic house itself, with its interesting court room, is magnificently situated in the midst of the ancient Forest of Dean.

The whole scene was one of great beauty, and the Local Committee did well to choose such a delightful spot for the Conference picnic.

After lunch had been partaken of and the usual toasts and votes of thanks accorded, a move was made for the station.

The train then "proceeded along the banks of the beautiful river Wye, where the scenery is rich beyond description." The river itself winds in folds and bends amongst closely wooded hills or under sheer cliffs and pinnacles of rock. Tintern was reached shortly before 4 o'clock, and the grand old ruins of the Abbey made a fitting resting place for those who appreciated its magnificent architecture and quiet grandeur.

After tea a photograph was taken, and the company split up into groups and wandered about by the river or in the woods until the time came for the return journey. This was by train direct to Bristol, which was reached about 9.30 p.m.

The weather was on the whole favourable during the week, considering the general tendency of the summer towards wet and cold.

THE LUNCHEONS.

These took place in the vestibule of the Royal Hotel on Tuesday and Wednesday, and appeared to give general satisfaction.

r Mixing GHT.			Product, Specific Gravity, and Proof Strength at 15°·5C.			Weight of one Gallon of Product.
n lcohol. 898.	From 60 o.p. Spirit.					
Water.	60 o.p. Spirit.	Water.	Product.	Sp. Gr.	Proof degs.	
	lb. oz.	lb. oz.				lb. oz.
	8 2[illegible]	2[illegible]	1 gall.	[illegible]	5[illegible] o.p.	8 5½

TABLES OF USEFUL INFORMATION FOR PHARMACISTS.

INDEX.

Table for Conversion of Grains into Grams.

Grns.	Grms.	Grns.	Grms.	Grns.	Grms.	Grns.	Grms.
1	·0648	54	3·4991	103	6·6743	152	9·8494
2	·1296	55	3·5639	104	6·7391	153	9·9142
3	·1944	56	3·6287	105	6·8039	154	9·9790
4	·3240	57	3·6935	106	6·8687	155	10·0438
6	·3888	58	3·7583	107	6·9335	156	10·1086
7	·4536	59	3·8231	108	6·9983	157	10·1734
8	·5184	60	3·8879	109	7·0631	158	10·2382
10	·6480	61	3·9527	110	7·1279	159	10·3030
11	·7128	62	4·0175	111	7·1927	160	10·3678
12	·7776	63	4·0823	112	7·2575	161	10·4326
13	·8424	64	4·1471	113	7·3223	162	10·4974
15	·9720	65	4·2119	114	7·3871	163	10·5622
16	1·0368	66	4·2767	115	7·4519	164	10·6270
17	1·1016	67	4·3415	116	7·5177	165	10·6918
18	1·1664	68	4·4063	117	7·5815	166	10·7566
20	1·2960	69	4·4711	118	7·6463	167	10·8214
21	1·3608	70	4·5359	119	7·7111	168	10·8862
22	1·4256	71	4·6007	120	7·7759	169	10·9510
23	1·4904	72	4·6655	121	7·8407	170	11·0158
24	1·5552	73	4·7303	122	7·9055	171	11·0806
25	1·6200	74	4·7951	123	7·9703	172	11·1454
26	1·6848	75	4·8599	124	8·0351	173	11·2102
27	1·7496	76	4·9247	125	8·0999	174	11·2750
28	1·8144	77	4·9895	126	8·1647	175	11·3398
29	1·8792	78	5·0543	127	8·2295	176	11·4046
30	1·9440	79	5·1191	128	8·2943	177	11·4694
31	2·0088	80	5·1839	129	8·3591	178	11·5342
32	2·0736	81	5·2487	130	8·4239	179	11·5990
33	2·1384	82	5·3135	131	8·4887	180	11·6638
34	2·2032	83	5·3783	132	8·5536	181	11·7286
35	2·2680	84	5·4431	133	8·6183	182	11·7934
36	2·3328	85	5·5079	134	8·6831	183	11·8582
37	2·3976	86	5·5727	135	8 7479	184	11·9230
38	2·4624	87	5·6375	136	8·8127	185	11·9878
39	2·5272	88	5·7023	137	8·8775	186	12·0526
40	2·5920	89	5·7671	138	8·9422	187	12·1174
41	2·6568	90	5·8319	139	9·0070	188	12·1822
42	2·7215	91	5·8967	140	9·0718	189	12·2470
43	2·7863	92	5·9615	141	9·1366	190	12·3118
44	2·8511	93	6·0263	142	9·2104	200	12·9598
45	2·9159	94	6·0911	143	9·2662	250	16·1997
46	2·9807	95	6·1559	144	9·3310	300	19·4397
47	3·0455	96	6·2207	145	9·3958	400	25·9196
48	3·1103	97	6·2855	146	9·4606	500	32·3995
49	3·1751	98	6·3503	147	9·5254	600	38·8794
50	3·2399	99	6·4151	148	9·5902	700	45·3593
51	3·3047	100	6·4799	149	9·6550	800	51·8392
52	3·3695	101	6·5447	150	9·7198	900	58·3190
53	3·4343	102	6·6095	151	9·7846	1000	64·7989

Conversion of Thermometric Scales.

Table I.

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
400	204·4	348	175·6	296	146·7	244	117·8
399	203·9	347	175·0	295	146·1	243	117·2
398	203·3	346	174·4	294	145·6	242	116·7
397	202·8	345	173·9	293	145·0	241	116·1
396	202·2	344	173·3	292	144·4	240	115·6
395	201·7	343	172·8	291	143·9	239	115·0
394	201·1	342	172·2	290	143·3	238	114·4
393	200·6	341	171·7	289	142·8	237	113·9
392	200·0	340	171·1	288	142·2	236	113·3
391	199·4	339	170·6	287	141·7	235	112·8
390	198·9	338	170·0	286	141·1	234	112·2
389	198·3	337	169·4	285	140·6	233	111·7
388	197·8	336	168·9	284	140·0	232	111·1
387	197·2	335	168·3	283	139·4	231	110·6
386	196·7	334	167·8	282	138·9	230	110·0
385	196·1	333	167·2	281	138·3	229	109·4
384	195·6	332	166·7	280	137·8	228	108·9
383	195·0	331	166·1	279	137·2	227	108·3
382	194·4	330	165·6	278	136·7	226	107·8
381	193·9	329	165·0	277	136·1	225	107·2
380	193·3	328	164·4	276	135·6	224	106·7
379	192·8	327	163·9	275	135·0	223	106·1
378	192·2	326	163·3	274	134·4	222	105·6
377	191·7	325	162·8	273	133·9	221	105·0
376	191·1	324	162·2	272	133·3	220	104·4
375	190·6	323	161·7	271	132·8	219	103·9
374	190·0	322	161·1	270	132·2	218	103·3
373	189·4	321	160·6	269	131·7	217	102·8
372	188·9	320	160·0	268	131·1	216	102·2
371	188·3	319	159·4	267	130·6	215	101·7
370	187·8	318	158·9	266	130·0	214	101·1
369	187·2	317	158·3	265	129·4	213	100·6
368	186·7	316	157·8	264	128·9	212	100·0
367	186·1	315	157·2	263	128·3	211	99·4
366	185·6	314	156·7	262	127·8	210	98·9
365	185·0	313	156·1	261	127·2	209	98·3
364	184·4	312	155·6	260	126·7	208	97·8
363	183·9	311	155·0	259	126·1	207	97·2
362	183·3	310	154·4	258	125·6	206	96·7
361	182·8	309	153·9	257	125·0	205	96·1
360	182·2	308	153·3	256	124·4	204	95·6
359	181·7	307	152·8	255	123·9	203	95·0
358	181·1	306	152·2	254	123·3	202	94·4
357	180·6	305	151·7	253	122·8	201	93·9
356	180·0	304	151·1	252	122·2	200	93·3
355	179·4	303	150·6	251	121·7	199	92·8
354	178·9	302	150·0	250	121·1	198	92·2
353	178·3	301	149·4	249	120·6	197	91·7
352	177·8	300	148·9	248	120·0	196	91·1
351	177·2	299	148·3	247	119·4	195	90·6
350	176·7	298	147·8	246	118·9	194	90·0
349	176·1	297	147·2	245	118·3	193	89·4

Conversion of Thermometric Scales (*continued*).

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
192	88·9	136	57·8	80	26·7	24	– 4·4
191	88·3	135	57·2	79	26·1	23	– 5·0
190	87·8	134	56·7	78	25·6	22	– 5·6
189	87·2	133	56·1	77	25·0	21	– 6·1
188	86·7	132	55·6	76	24·4	20	– 6·7
187	86·1	131	55·0	75	23·9	19	– 7·2
186	85·6	130	54·4	74	23·3	18	– 7·8
185	85·0	129	53·9	73	22·8	17	– 8·3
184	84·4	128	53·3	72	22·2	16	– 8·9
183	83·9	127	52·8	71	21·7	15	– 9·5
182	83·3	126	52·2	70	21·1	14	–10·0
181	82·8	125	51·7	69	20·6	13	–10·6
180	82·2	124	51·1	68	20·0	12	–11·1
179	81·7	123	50·6	67	19·4	11	–11·7
178	81·1	122	50·0	66	18·9	10	–12·2
177	80·6	121	49·4	65	18·3	9	–12·8
176	80·0	120	48·9	64	17·8	8	–13·3
175	79·4	119	48·3	63	17·2	7	–13·9
174	78·9	118	47·8	62	16·7	6	–14·4
173	78·3	117	47·2	61	16·1	5	–15·0
172	77·8	116	46·7	60	15·6	4	–15·6
171	77·2	115	46·1	59	15·0	3	–16·1
170	76·7	114	45·6	58	14·4	2	–16·7
169	76·1	113	45·0	57	13·9	1	–17·2
168	75·6	112	44·4	56	13·3	0	–17·8
167	75·0	111	43·9	55	12·8	– 1	–18·3
166	74·4	110	43·3	54	12·2	– 2	–18·9
165	73·9	109	42·8	53	11·7	– 3	–19·4
164	73·3	108	42·2	52	11·1	– 4	–20·0
163	72·8	107	41·7	51	10·6	– 5	–20·6
162	72·2	106	41·1	50	10·0	– 6	–21·1
161	71·7	105	40·6	49	9·4	– 7	–21·7
160	71·1	104	40·0	48	8·9	– 8	–22·2
159	70·6	103	39·4	47	8·3	– 9	–22·8
158	70·0	102	38 9	46	7·8	–10	–23·3
157	69·4	101	38·3	45	7·2	–11	–23·9
156	68·9	100	37·8	44	6·7	–12	–24·4
155	68·3	99	37·2	43	6·1	–13	–25·0
154	67·8	98	36·7	42	5·6	–14	–25·6
153	67·2	97	36·1	41	5·0	–15	–26·1
152	66·7	96	35·6	40	4·4	–16	–26·7
151	66·1	95	35·0	39	3·9	–17	–27·2
150	65·6	94	34·4	38	3·3	–18	–27·8
149	65·0	93	33·9	37	2·8	–19	–28·3
148	64·4	92	33·3	36	2·2	–20	–28·9
147	63·9	91	32·8	35	1·7	–21	–29·4
146	63·3	90	32·2	34	1·1	–22	–30·0
145	62·8	89	31·7	33	0 6	–23	–30·6
144	62·2	88	31·1	32	0·0	–24	–31·1
143	61·7	87	30·6	31	–0·6	–25	–31·7
142	61·1	86	30·0	30	–1·1	–26	–32·2
141	60·6	85	29·4	29	–1·7	–27	–32·8
140	60·0	84	28·9	28	–2·2	–28	–33·3
139	59·4	83	28·3	27	–2·8	–29	–33·9
138	58·9	82	27·8	26	–3·3	–30	–34·4
137	58·3	81	27·2	25	–3·9	–31	–35·0

Table Showing the Value of 1 lb. and 1 cwt. in English Money when the Article is Quoted per Kilo in Francs.

If 1 kilo costs		1 lb. will cost			1 cwt. will cost			If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.	Fr.	cts.	£	s.	d.	£	s.	d.
–	5	–	–	–¼	–	2	0½	2	50	–	–	10⅞	5	1	7¼
–	10	–	–	–½	–	4	0¾	2	55	–	–	11⅛	5	3	7¾
–	15	–	–	–⅝	–	6	1¼	2	60	–	–	11⅜	5	5	8
–	20	–	–	–⅞	–	8	1½	2	65	–	–	11½	5	7	8½
–	25	–	–	1⅛	–	10	2	2	70	–	–	11¾	5	9	8¾
–	30	–	–	1⅜	–	12	2½	2	75	–	1	0	5	11	9
–	35	–	–	1½	–	14	2¾	2	80	–	1	0¼	5	13	9½
–	40	–	–	1¾	–	16	3	2	85	–	1	0⅜	5	15	9¾
–	45	–	–	2	–	18	3¼	2	90	–	1	0⅝	5	17	10¼
–	50	–	–	2¼	1	0	3¾	2	95	–	1	0⅞	5	19	10¾
–	55	–	–	2⅜	1	2	4¼	3	0	–	1	1⅛	6	1	11¼
–	60	–	–	2⅝	1	4	4½	3	5	–	1	1¼	6	3	11½
–	65	–	–	2⅞	1	6	5	3	10	–	1	1½	6	5	11¾
–	70	–	–	3⅛	1	8	5	3	15	–	1	1¾	6	8	0¼
–	75	–	–	3¼	1	10	5¾	3	20	–	1	1⅞	6	10	0¾
–	80	–	–	3½	1	12	6¼	3	25	–	1	2⅛	6	12	1
–	85	–	–	3¾	1	14	6½	3	30	–	1	2⅜	6	14	1½
–	90	–	–	3⅞	1	16	7	3	35	–	1	2⅝	6	16	1¾
–	95	–	–	4⅛	1	18	7¼	3	40	–	1	2¾	6	18	2¼
1	0	–	–	4⅜	2	0	7¾	3	45	–	1	3	7	0	2¾
1	5	–	–	4⅝	2	2	8¼	3	50	–	1	3¼	7	2	3
1	10	–	–	4¾	2	4	8½	3	55	–	1	3½	7	4	3¼
1	15	–	–	5	2	6	8¾	3	60	–	1	3⅝	7	6	3½
1	20	–	–	5¼	2	8	9	3	65	–	1	3⅞	7	8	4
1	25	–	–	5½	2	10	9½	3	70	–	1	4⅛	7	10	4½
1	30	–	–	5⅝	2	12	10	3	75	–	1	4⅜	7	12	4¾
1	35	–	–	5⅞	2	14	10¼	3	80	–	1	4½	7	14	5¼
1	40	–	–	6⅛	2	16	10¾	3	85	–	1	4¾	7	16	5½
1	45	–	–	6⅜	2	18	11	3	90	–	1	5	7	18	6
1	50	–	–	6½	3	0	11½	3	95	–	1	5¼	8	0	6½
1	55	–	–	6¾	3	3	0	4	0	–	1	5⅜	8	2	7
1	60	–	–	7	3	5	0¼	4	5	–	1	5⅝	8	4	7½
1	65	–	–	7¼	3	7	0¾	4	10	–	1	5⅞	8	6	7¾
1	70	–	–	7⅜	3	9	1	4	15	–	1	6⅛	8	8	8
1	75	–	–	7⅝	3	11	1½	4	20	–	1	6¼	8	10	8½
1	80	–	–	7⅞	3	13	2	4	25	–	1	6½	8	12	8¾
1	85	–	–	8⅛	3	15	2¼	4	30	–	1	6¾	8	14	9
1	90	–	–	8¼	3	17	2¾	4	35	–	1	6⅞	8	16	9½
1	95	–	–	8½	3	19	3	4	40	–	1	7⅛	8	18	9¾
2	0	–	–	8¾	4	1	3¼	4	45	–	1	7⅜	9	0	10¼
2	5	–	–	8⅞	4	3	3¾	4	50	–	1	7⅝	9	2	10½
2	10	–	–	9⅛	4	5	4	4	55	–	1	7¾	9	4	11
2	15	–	–	9⅜	4	7	4¼	4	60	–	1	8	9	6	11½
2	20	–	–	9⅝	4	9	4¾	4	65	–	1	8¼	9	8	11¾
2	25	–	–	9¾	4	11	5¼	4	70	–	1	8½	9	11	0¼
2	30	–	–	10	4	13	5¾	4	75	–	1	8⅝	9	13	0½
2	35	–	–	10¼	4	15	6	4	80	–	1	8⅞	9	15	1
2	40	–	–	10½	4	17	6½	4	85	–	1	9⅛	9	17	1½
2	45	–	–	10⅝	4	19	7	4	90	–	1	9⅜	9	19	1¾

Table showing the Value of 1 lb. and 1 cwt. in English Money when the Article is Quoted per Kilo in Francs (*continued*).

If 1 kilo costs		1 lb. will cost			1 cwt. will cost			If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.	Fr.	cts.	£	s.	d.	£	s.	d.
4	95	–	1	9½	10	1	2¼	8	80	–	3	2¼	17	17	7¾
5	0	–	1	9¾	10	3	2½	8	90	–	3	2¾	18	1	8¾
5	10	–	1	10¼	10	7	3¼	9	0	–	3	3⅛	18	5	9¼
5	20	–	1	10⅝	10	11	4	9	10	–	3	3⅝	18	9	10
5	30	–	1	11⅛	10	15	4¾	9	20	–	3	4	18	13	10¾
5	40	–	1	11½	10	19	5½	9	30	–	3	4½	18	17	11½
5	50	–	1	11⅞	11	3	6¼	9	40	–	3	4⅞	19	2	0½
5	60	–	2	0⅜	11	7	7¼	9	50	–	3	5⅜	19	6	1¼
5	70	–	2	0¾	11	11	8	9	60	–	3	5¾	19	10	2
5	80	–	2	1¼	11	15	8¾	9	70	–	3	6¼	19	14	2¾
5	90	–	2	1⅝	11	19	9¼	9	80	–	3	6⅝	19	18	3¼
6	0	–	2	2⅛	12	3	10¼	9	90	–	3	7⅛	20	2	4¼
6	10	–	2	2½	12	7	11	10	–	–	3	7½	20	6	5
6	20	–	2	3	12	11	11¾	11	–	–	3	11⅞	22	7	0¾
6	30	–	2	3⅜	12	16	0½	12	–	–	4	4¼	24	7	8½
6	40	–	2	3⅞	13	0	1¼	13	–	–	4	8⅝	26	8	4
6	50	–	2	4¼	13	4	2½	14	–	–	5	1	28	9	0
6	60	–	2	4¾	13	8	2¾	15	–	–	5	5¼	30	9	7½
6	70	–	2	5⅛	13	12	3½	16	–	–	5	9⅝	32	10	3¼
6	80	–	2	5⅝	13	16	4¼	17	–	–	6	2	34	10	11
6	90	–	2	6	14	0	5	18	–	–	6	6⅜	36	11	6½
7	0	–	2	6½	14	4	6	19	–	–	6	10¾	38	12	2¼
7	10	–	2	6⅞	14	8	6¾	20	–	–	7	3	40	12	10
7	20	–	2	7⅜	14	12	7½	30	–	–	10	10⅝	60	19	3
7	30	–	2	7¾	14	16	8¼	40	–	–	14	6⅛	81	5	8
7	40	–	2	8¼	15	0	9	50	–	–	18	1¾	101	12	1
7	50	–	2	8⅝	15	4	9¾	60	–	1	1	9¼	121	18	6
7	60	–	2	9⅛	15	8	10½	70	–	1	5	4¾	142	4	11
7	70	–	2	9½	15	12	11¼	80	–	1	9	0⅜	162	11	4
7	80	–	2	9⅞	15	17	0¼	90	–	1	12	7⅞	182	17	9
7	90	–	2	10⅜	16	1	0¾	100	–	1	16	3½	203	4	2
8	0	–	2	10¾	16	5	1¾	200	–	3	12	7	406	8	4
8	10	–	2	11¼	16	9	2½	300	–	5	8	10¼	609	12	7
8	20	–	2	11⅝	16	13	3	400	–	7	5	1¾	812	16	9
8	30	–	3	0⅛	16	17	3¾	500	–	9	1	5¼	1016	0	11
8	40	–	3	0½	17	1	4¾	600	–	10	17	8¾	1219	5	2
8	50	–	3	1	17	5	5½	700	–	12	14	0	1422	9	4
8	60	–	3	1⅜	17	9	6¼	1000	–	18	2	10½	2032	1	11
8	70	–	3	1⅞	17	13	7								

Table showing Equivalent Rates per Lb. and Cwt.

Per lb.	Per cwt.		Per lb.	Per cwt.		Per lb.	Per cwt.	
d.	s.	d.	d.	s.	d.	d.	s.	d.
¼	2	4	4¼	39	8	8¼	77	0
½	4	8	4½	42	0	8½	79	4
¾	7	0	4¾	44	4	8¾	81	8
1	9	4	5	46	8	9	84	0
1¼	11	8	5¼	49	0	9¼	86	4
1½	14	0	5½	51	4	9½	88	8
1¾	16	4	5¾	53	8	9¾	91	0
2	18	8	6	56	0	10	93	4
2¼	21	0	6¼	58	4	10¼	95	8
2½	23	4	6½	60	8	10½	98	0
2¾	25	8	6¾	63	0	10¾	100	4
3	28	0	7	65	4	11	102	8
3¼	30	4	7¼	67	8	11¼	105	0
3½	32	8	7½	70	0	11½	107	4
3¾	35	0	7¾	72	4	11¾	109	8
4	37	4	8	74	8	12	112	0

Pharmacy and Poison Laws of Great Britain and Ireland.

GREAT BRITAIN.

The Arsenic Act, 1851, recites conditions for the sale of white arsenic.

The Pharmacy Act, 1852, gave the Pharmaceutical Society of Great Britain power to hold examinations and grant title of pharmaceutical chemist.

The Pharmacy Act, 1868, comprises regulations for the sale of poisons and registration of retailers and dispensers of same.

The Pharmacy Act, 1869, amends provisions of 1868 Act in the case of medical practitioners and veterinary surgeons.

The Pharmacy Act, 1898, enables chemists and druggists to become members of the Pharmaceutical Society.

Schedule of Poisons.
Part 1.

The poisons named in this part may not be sold by retail unless:

(1) The purchaser be known to the seller, or be introduced by a person known to the seller also.

(2) Each sale be entered in the poison book as follows: (*a*) date of sale; (*b*) name and address of purchaser; (*c*) name and quantity of poison sold;

IRELAND.

The Arsenic Act, 1851.

Sale of Poisons Act (Ireland), 1870, relates to the sale of poisons and adulteration.

Pharmacy Act (Ireland), 1875, creates the Pharmaceutical Society of Ireland, and provides for registration of dispensers and retailers of poisons.

Pharmacy Act (Ireland), 1875, Amendment Act, 1890, creates registered druggists.

Statute-Law Revision (No. 2) Act, 1893, repeals a few minor enactments of the Acts 1870 and 1875.

Schedule of Poisons.
Part 1.

Same as in Great Britain.

GREAT BRITAIN.	IRELAND.
SCHEDULE OF POISONS (*continued*).	
(*d*) purpose for which it is stated to be required; (*e*) signature of the purchaser, and introducer, if any (Arsenic, *vide* p. 617).	
(3) The poison sold must be labelled with (*f*) the name of the article; (*g*) the word "Poison"; (*h*) the name and address of the seller.	
Aconite and its preparations. Arsenic and its preparations. Atropine and its preparations. Cantharides. Corrosive sublimate. Cyanide of potassium and all metallic cyanides. Emetic tartar. Ergot of rye and its preparations. Prussic acid. Savin and its oil. Strychnine. All poisonous vegetable alkaloids and their salts.	Same as in Great Britain.
PART 2.	PART 2.
The poisons named in this part may not be sold by retail unless labelled with (*a*) the name of the article; (*b*) the word "poison"; (*c*) the name and address of the seller.	Same as in Great Britain.
Ammoniated mercury (commonly known as white precipitate of mercury). Belladonna and its preparations. Cantharides, tincture and all vesicating liquid preparations of. Liquid preparations of carbolic acid and its homologues containing more than 3 per cent. of those substances, except any preparation used as a sheepwash or for any other purpose in connection with agriculture or horticulture. Chloral hydrate and its preparations. Chloroform. Corrosive sublimate, preparations of. Essential oil of almonds, unless deprived of its prussic acid. Morphine, preparations of. Nux vomica and its preparations. Opium and all preparations of opium or of poppies. Oxalic acid. Phenol and its homologues (liquid preparations containing more than 3 per cent.). Red oxide of mercury (commonly known as red precipitate of mercury). Vermin-killers, *i.e.*, "every compound containing any poison within the meaning of the Pharmacy Act, 1868, when prepared or sold for the destruction of vermin."	Same as in Great Britain, with the following additions. Sulphuric ether. Phosphorus, and all preparations containing it in a free state. Preparations of strychnine. Biniodide of mercury.

POSTAL REGULATIONS.

PRINCIPAL POST-OFFICE CHARGES.

Letter Post.

Inland.—Not exceeding 4 oz.	1*d.*
For every additional 2 oz.	½*d.*
Postcard	½*d.*

Colonial and Foreign.—To undermentioned British Possessions and Protectorates, viz.: Aden, Ascension, Bahamas, Barbados, Bermudas, British Central Africa, British East Africa, British Guiana, British Honduras, British North Borneo, Canada, Cape Colony, Cayman Islands, Ceylon, China (places at which British post offices are maintained), Cyprus, Falkland Islands, Fiji, Gambia, Gibraltar, Gold Coast, Hong Kong, India, Jamaica, Johore, Labuan, Lagos, Leeward Islands (viz., Antigua, St. Kitts, Nevis, Dominica, Montserrat, and the Virgin Islands), Malay States (Protected, viz., Perak, Selangor, Negri-Sembilan, and Pahang), Malta, Mauritius, Natal, Newfoundland, New Zealand, Niger Coast Protectorate, Niger Territory, St. Helena, Sarawak, Seychelles, Sierra Leone, Somaliland, Straits Settlements, Tobago, Transvaal, Trinidad, Turk's Islands, Uganda, Windward Islands (viz., Grenada, St. Lucia, St. Vincent, and the Grenadines), and Zanzibar.

Per ½ oz.	1*d.*
Elsewhere per ½ oz.	2½*d.*
Postcard	1*d.*

Book Post.

Inland.—Not exceeding 2 oz.	½*d.*
For every additional 2 oz.	½*d.*
Colonial and Foreign.—Per 2 oz.	½*d.*

Parcel Post.

Inland.—Not exceeding 1 lb. . . . . 3*d.*
And 1*d.* for each additional 1 lb. up to 11 lbs., which is the maximum.

Newspaper Post.

Inland.—Each registered newspaper . . . . . ½*d.*
Colonial and Foreign as book post.

Telegrams.

Inland.—For first twelve words	6*d.*
For each additional word	½*d.*

Postal Orders.

The orders are issued for the following amounts, upon which poundage is charged as follows:—

Amount.	*Poundage.*
6*d.*, 1*s.*, 1*s.* 6*d.*	each, ½*d.*
2*s.*, 2*s.* 6*d.*, 3*s.*, 3*s.* 6*d.*, 4*s.*, 4*s.* 6*d.*, 5*s.*, 5*s.* 6*d.*, 6*s.*, 6*s.* 6*d.*, 7*s.*, 7*s.* 6*d.*, 8*s.*, 8*s.* 6*d.*, 9*s.*, 9*s.* 6*d.*, 10*s.*, 10*s.* 6*d.*	each, 1*d.*
11*s.*, 11*s.* 6*d.*, 12*s.*, 12*s.* 6*d.*, 13*s.*, 13*s.* 6*d.*, 14*s.*, 14*s.* 6*d.*, 15*s.*, 15*s.* 6*d.*, 16*s.*, and 20*s.*	each, 1½*d.*

Postal orders for other amounts between 16*s.* 6*d.* and 21*s.* will be introduced during the current year.

Inland Money Orders.

For sums not exceeding £1	2*d.*
„ exceeding £1 and not exceeding £3	3*d.*
„ „ £3 „ „ £10	4*d.*

Money Orders for Places Abroad.

For sums not exceeding £2	6*d.*
„ exceeding £2 and not exceeding £6	1*s.*
„ „ £6 „ „ £10	1*s.* 6*d.*

Registration.

Letters, parcels, and postal packets are registered at 2*d.* to 1*s.* 2*d.* each, the compensation ranging from £5 to £120. Coins, watches, or jewellery must be registered. The letters or packets must be marked "Registered," and handed over the counter at a post office. The special post office envelopes should be used when possible.

Newspapers and Books.

The postal rate on newspapers is ½*d.* each. A packet must not exceed 5 lbs. in weight or 2 feet in length or 1 foot in width or depth. Newspaper wrappers bearing ½*d.* or 1*d.* stamps are obtainable at 4*d.* for seven or 8½*d.* for eight.

Books, if sent by book-post, must be posted either without wrapper, or in an unsealed envelope or cover so as to be easy of inspection. Size of the packet allowed is the same as for newspapers.

Commercial papers such as invoices, orders for goods, advice notes, waybills, bills of lading, receipts, statements of account, prices current, market reports, etc., are accepted for transmission at the book packet rate, conditionally upon nothing appearing in writing on the documents save dates, the names and addresses of the parties, the particulars and prices of any goods, or the particulars of any sums of money to which the document relates, and the mode of consignment of any such goods or money. Matter in the nature of a letter must be wholly in print, and must relate exclusively to the subject-matter of the document.

Circulars are also received at the book rate.

Parcels.

Limitations.—The size for an inland parcel is—

Greatest length, 3½ feet; greatest length and girth combined, 6 feet.

The maximum weight allowed for an inland parcel is 11 lbs.

Parcels to or from the Channel Islands or the Isle of Man and the United Kingdom are liable to Customs duty on delivery if they contain anything dutiable.

Compensation up to £2 is allowed for parcels lost or damaged though not registered, under certain conditions, ***but not for fragile or perishable articles.***

Colonial and Foreign Service.

Book Post.—The articles permitted to be sent at the book post rate are printed, and commercial papers similar in nature to those already described. The lowest charge for books is ½*d.*, and for commercial papers, 2½*d.*, and up to 10 oz. may be sent for the latter sum. Packets addressed to British Colonies or Possessions and non-Union countries must not exceed 2 feet long and 1 foot wide or deep, and 5 lbs. in weight. To Foreign Countries in the Postal Union the length is limited to 18 inches, and the weight to 4 lbs. A roll may be 30 inches long and 4 inches in diameter. The packets must be open for inspection.

Patterns and Samples.—Rate, 1*d.* the first 4 oz., ½*d.* for every additional 2 oz. The samples must be *bonâ fide* trade patterns or samples of merchandise, so packed as to give freedom of inspection. The limit of weight for British Colonies or Possessions or for non-Union countries is 5 lbs., and of dimensions 2 feet by 1 foot by 1 foot.

Parcels conveyed to colonial and foreign parts through the Post Office are subject to the Customs regulations of the country to which they are addressed. Declarations have to be made by the sender ***on forms obtainable from the Post Office.*** Generally an invoice may be enclosed in the parcel, but not a letter.

Profit Assessment.

The following examples show how the questions of profits and percentages upon cost and sales can be calculated. The cost and profit figures may be taken as either pounds, shillings, pence, or farthings.

1. To find the percentage of profit on cost—

Say the cost is 8 and the profit 4.

$$4 \times 100 = 400 \div 8 = 50 \text{ per cent.}$$

2. To find the percentage of profit on sales—

Taking the same figures for cost and profit.

$$4 \times 100 = 400 \div 12\ (4+8) = 33 \text{ per cent.}$$

3. To find what amount to add to cost to realize a certain rate per cent. upon the cost—

Say the cost is 6 and the rate required 25 per cent.

$$6 \times 25 = 150 \div 100 = 1{\cdot}5\,;$$

which may be £1 10*s.*, 1*s.* 6*d.*, or 1½*d.*

4. To find what amount to add to cost to produce a certain rate per cent. upon sales—

Say the cost is 6 and the rate 25.

$$6 \times 25 = 150 \div 75\ (100-25) = 2.$$

A Handy Table for Assessing Profits.

By adding to the cost, as follows, the relative percentages of profit are obtained:—

One half	50 per	cent. on cost,	and	33 per	cent. on sales.	
„ third	33·33	„	„	25	„	„
„ fourth	25	„	„	20	„	„
„ fifth	20	„	„	16·6	„	„
„ sixth	16·6	„	„	14·28	„	„
„ seventh	14·28	„	„	12·5	„	„
„ eighth	12·5	„	„	11·11	„	„
„ ninth	11·11	„	„	10	„	„
„ tenth	10	„	„	9·09	„	„
„ eleventh	9·09	„	„	8·33	„	„
„ twelfth	8·33	„	„	7·69	„	„
„ thirteenth	7·69	„	„	7·14	„	„
„ fourteenth	7·14	„	„	6·66	„	„
„ fifteenth	6·66	„	„	6·25	„	„
„ sixteenth	6·25	„	„	5·88	„	„
„ seventeenth	5·88	„	„	5·55	„	„
„ eighteenth	5·55	„	„	5·26	„	„
„ nineteenth	5·26	„	„	5	„	„
„ twentieth	5	„	„	4·76	„	„

Relation of the Imperial to the Metric Standards.

Standards of Mass.

1 Pound=453·59243 grammes.
1 Ounce=28·34953 grammes, or 28·35 grm. nearly.
1 Grain=0·0647989 18 gramme, or 0·0648 grm. „

Standards of Capacity.

1 Gallon=4·5459631 litres.
1 Pint=0·5682454 litre, or 568·336 cubic centimetres nearly.
1 Fluid Ounce=0·0284123 litre, or 28·417 cubic centimetres nearly.
1 Fluid Drachm=0·003552 litre, or 3·552 cubic centimetres ,
1 Minim=0·000059 litre, or 0·059 cubic centimetre nearly.

Standards of Length.

1 Yard=0·914399 metre.
1 Foot=0·30480 metre=30·48 centimetres.
1 Inch=0·02540 metre=25·40 millimetres.

Various Useful Data.

To reduce specific gravity with regard to air, to specific gravity with regard to hydrogen, multiply by 14·438.

To reduce specific gravity with regard to hydrogen, to specific gravity compared to air, multiply by ·06926.

To reduce weight in air to weight in vacuo:

P=weight required in vacuo.
q=weight in air.
V=volume of body weighed.
v=volume of the weights.
s=specific gravity of air (weight of one cubic unit).

$$P=q \times s\ (V-v).$$

To find the circumference of a circle:

a=circumference. r=diameter.
n=3·1415926. a=n r.

To find contents of a sphere=c:

$c=d^3 \times \cdot 5236$. d=diameter.

To find contents of a cylinder=c:

c=area of base, × height.

To find the contents of a rectangular vessel=c:

a=length. h=height.
b=breadth. c=a × b × h.

To convert the degrees of Twaddle's hydrometer into specific gravity, multiply by 5, and add 1000; this gives the specific gravity with reference to water as 1000.

To convert lbs. per square inch into kilograms per square centimetre, multiply by ·0703.

To convert kilograms per square centimetre into lbs. per square inch, multiply by 14·2247.

To reduce inches to metres, multiply by ·02540.
To reduce inches to centimetres, multiply by 2·540.
To reduce centimetres to inches, multiply by ·3937.
To reduce kilograms to pounds, multiply by 2·2046.
To reduce litres to gallons, multiply by ·22.
To reduce gallons to litres, multiply by 4·548.
To reduce pints to cubic centimetres, multiply by 567·936.
To reduce grams to grains, multiply by 15·432.
To reduce grains to grams, multiply by ·0648.
To reduce ounces to grams, multiply by 28·349.

The following data are useful in calculations relating to air:

To find the quantity of nitrogen by volume corresponding to 1 volume of oxygen, multiply by 3·770992.

To find the quantity of oxygen by volume corresponding to 1 volume of nitrogen, multiply by ·265182.

To find the quantity of nitrogen by weight corresponding to 1 part by weight of oxygen, multiply by 3·313022.

To find the quantity of oxygen by weight corresponding to 1 part by weight of nitrogen, multiply by ·301839.

To find the quantity of nitrogen by volume corresponding to 1 part by weight of oxygen, multiply by 2·6965411.

To find the quantity of oxygen by volume corresponding to 1 part by weight of nitrogen, multiply by ·2730071.

To find the quantity of nitrogen by weight corresponding to 1 part by volume of oxygen, multiply by 3·6629154.

To find the quantity of oxygen by weight corresponding to 1 part by volume of nitrogen, multiply by ·3792848.

Weights and Measures of Imperial System.

Measures of Mass.

1 grain	gr.	
1 ounce (avoir.)	oz.	=437·5 grains.
1 pound	lb.=16 ounces=	7000 „

Measures of Capacity.

1 minim	min.	
1 fluid drachm	fl. drm.	=60 minims.
1 fluid ounce	fl. oz.	= 8 fluid drachms.
1 pint	O	=20 fluid ounces.
1 gallon	C	= 8 pints.

Measures of Length.

1 inch	in.	
1 foot	ft.	=12 inches.
1 yard	yd.	=36 „

Relation of Volume to Mass.

1 minim is the volume at 62°F. of			0·9114583 grain of water.		
1 fluid drachm	„	„	54·6875	grains	„
1 fluid ounce	„	1 ounce or	437·5	„	„
1 pint	„	1·25 pounds or	8750·0	„	„
1 gallon	„	10 pounds or	70000·0	„	„
109·7143 minims[1]=the volume at 62°F. of			100	„	„

Weights and Measures of Metric System.

Measures of Mass.

1 milligramme=the thousandth part of one grm. or 0·001 grm.
1 centigramme=the hundredth part of one grm. or 0·01 grm.
1 decigramme =the tenth part of one grm. or 0·1 grm.
1 gramme =weight of one millilitre of distilled water at 4°C. (39·2°F.) or 1·0 grm.
1 dekagramme=ten grammes or 10·0 grm.
1 hectogramme=one hundred grammes or 100·0 grm.
1 kilogramme =one thousand grammes or 1000·0 grm.

[1] Taken as 110 minims throughout the Pharmacopœia.

Measures of Capacity.

1 millilitre	= the volume at 4°C.	of 1 grm. of water.		
1 centilitre	= „	„	of 10	„
1 decilitre	= „	„	of 100	„
1 litre	= „	„	of 1000 grm. (1 kilog.).	

Measures of Length.

1 millimetre	= one thousandth	part of one metre		or 0·001	metre.
1 centimetre	= one hundredth	„	„	or 0·01	„
1 decimetre	= one tenth	„	„	or 0·1	„
1 metre				1·0	„

Relation of Cubic Measures to Measures of Capacity.

1 cubic centimetre = 0·99984 millilitre.
1 cubic decimetre = 0·99984 litre, or 1000 cub. centim.

1·00016 cubic centimetres = 1 millilitre.
1·00016 cubic decimetres = 1 litre, or 1000 millilitres.

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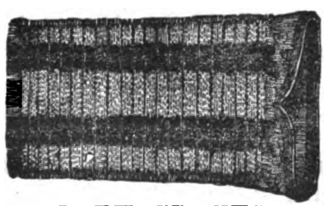

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